

The Mining Journal

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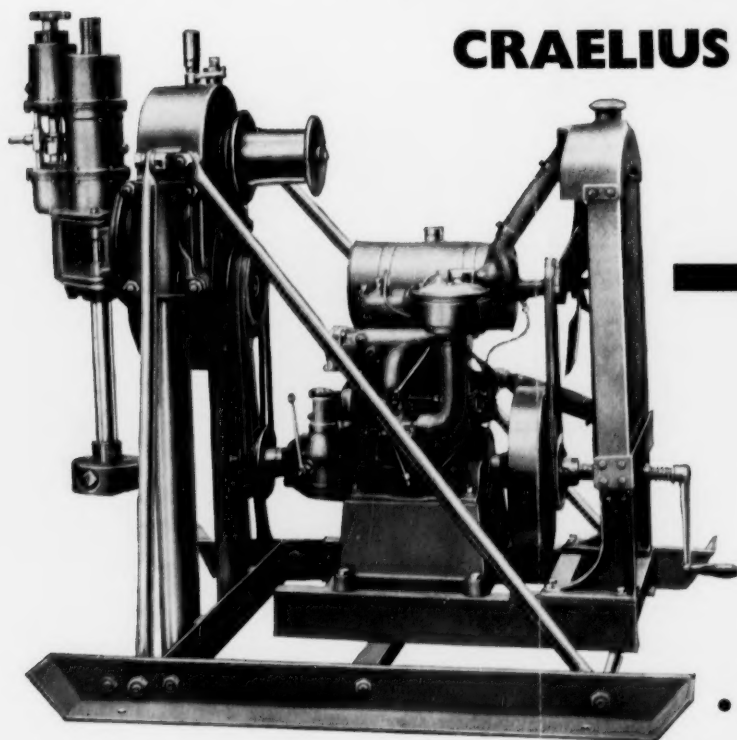
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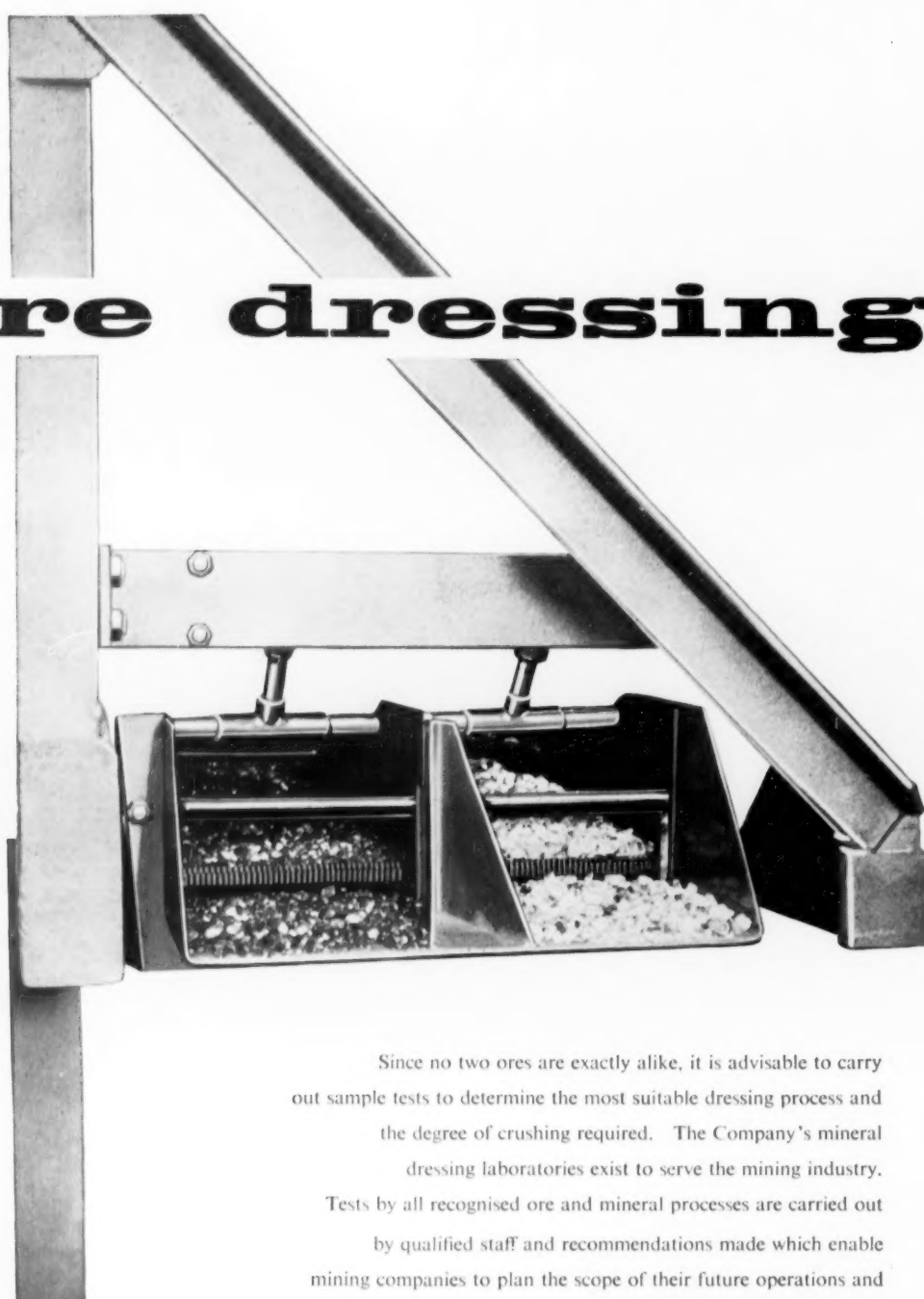
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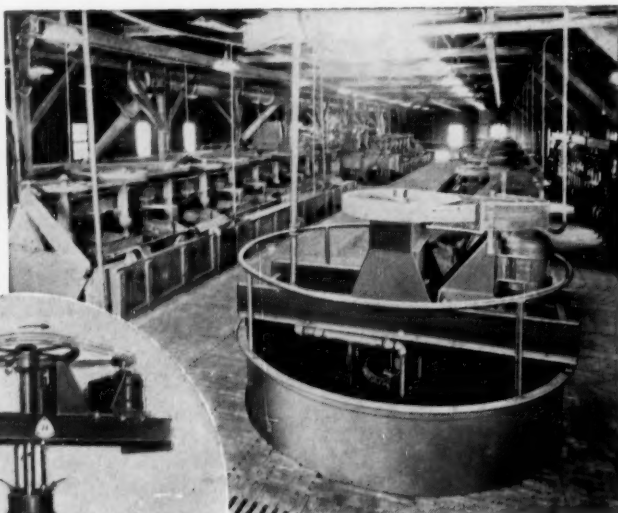
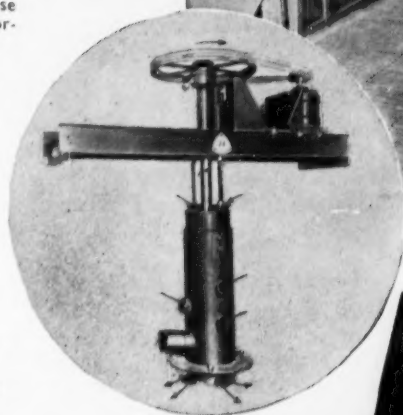
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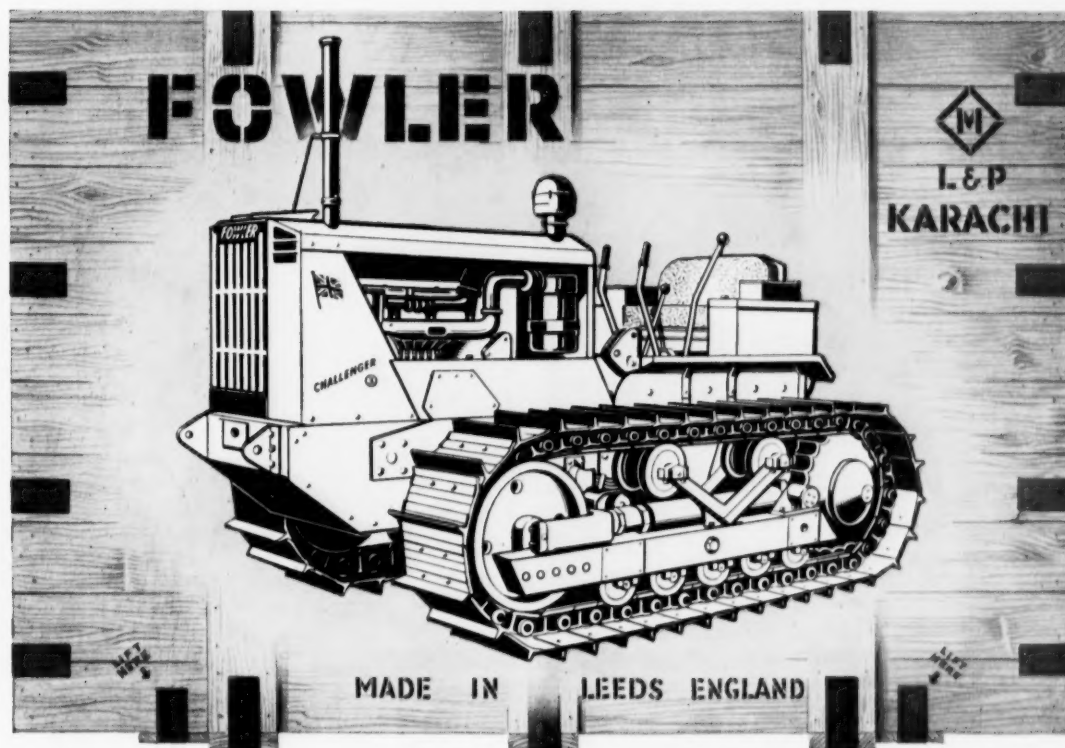
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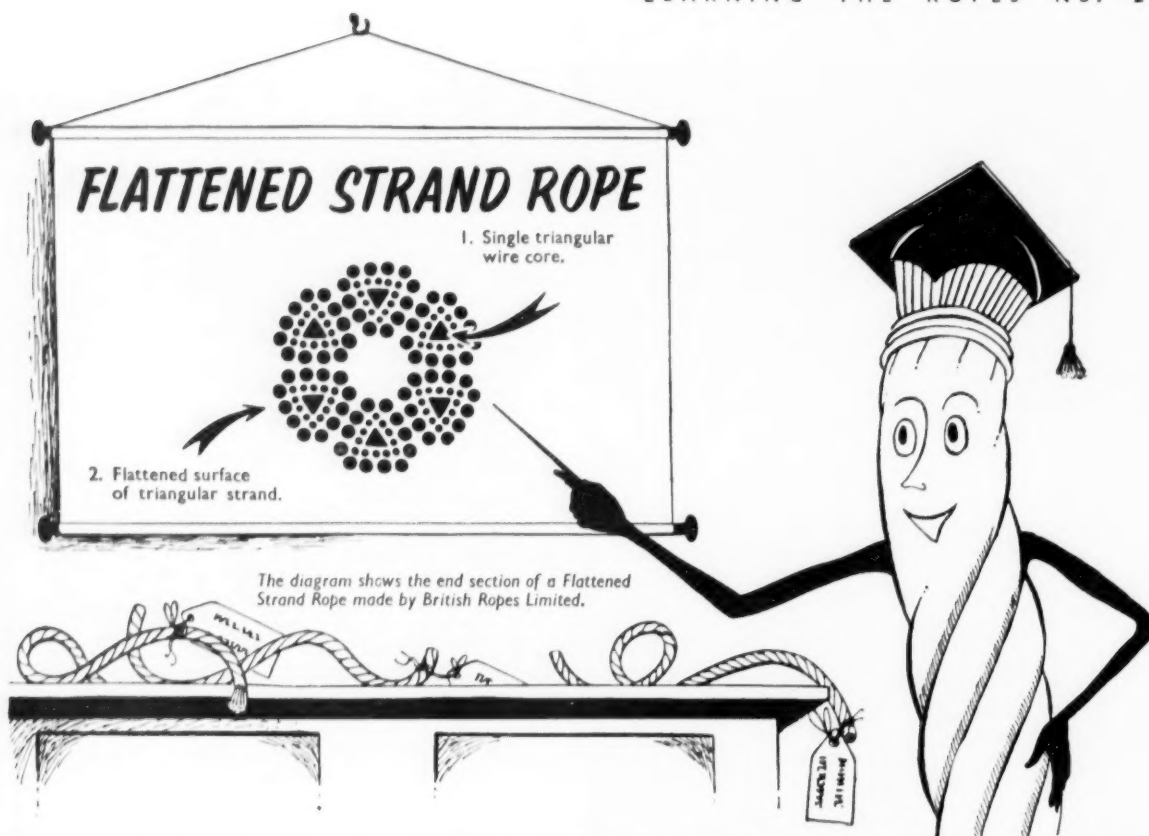
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NOTES AND COMMENTS

The Price of Coal

There is no doubt that the government are in serious trouble, though they deserve some sympathy for running into a coal crisis during the rarity of a heat wave. Even the most ardent supporters of a free (and therefore even higher) price for coal are not really going to like paying 18 per cent more for it, while Mr. Nabarro has touched off a minor internal party revolt. Mr. Nabarro is ebullient rather than influential and his revolt is not to be compared with that of Captain Waterhouse in the last Parliament; yet the Suez Canal problem is one that has been solved once and for all and for good or ill, but the coal problem is going to plague the government for a good many years to come.

There are in fact two coal problems. The first is how to price coal in a state of chronic shortage. The second is whether to continue to export it if imports of a comparable and perhaps greater quantity (and almost certainly of greater cost) are consequently needed.

The second is the less important but is best dealt with first. At first sight it would be much the best thing to give up the pretence of keeping valuable export markets sweet until such time as coal becomes plentiful, for the simple reason that for as long as can be foreseen it is not going to be plentiful. Furthermore imported coal is always going to be expensive, whatever the state of the market, because British ports are not fitted out to receive it and it has to be transhipped from the Continent. Finally since less per ton is made on exported coal than is lost on imported coal the N.C.B.'s accounts would look a little healthier. Yet there may be a balance of advantage in keeping these exports though, if this is admitted, there is also a case for accepting the net loss on overseas coal trade as a charge on the Treasury if the net loss becomes too great. Countries like Sweden and Denmark—valuable export markets—depend desperately on British coal; Sweden is particularly anxious because she imports large quantities of coal from the Schuman countries but does not belong to the community. Just as the Indian market is not going to be jeopardized at the behest of the Lancashire cotton industry so there is no reason why the Swedish, Danish, and other markets should be sacrificed to balance the N.C.B.'s ac-

counts. In other words the decision whether to export or not, or on what scale, should be made in the best interests of the economy as a whole and not in the narrower interests of the N.C.B.

The pricing problem is much more difficult. In one sense the increase of 18 per cent is insignificant, for Sir Leslie Hollinghurst has told us that industrial firms can save 15 to 20 per cent of their coal consumption; yet those firms that already are efficient consumers will also have to bear the cost and none of us really believes that this is the last of the increases. Nor is the argument that British coal is still cheaper than that of most other countries of much comfort. It is no use, for example, comparing the cost of British and American coal, since to Britain coal is fuel whereas the United States has abundant cheap natural gas and hydro-electric power and her fuel oils are lightly taxed. Taking account of the latest oil price increase, oil still has the edge on coal.

No, the increase is serious; there is no getting away from it. Some, indeed, have argued it ought to have gone up sooner and further. No doubt the general election was responsible for the delay. If coal had gone up more (and a "free" price mechanism would undoubtedly send it higher) some economy would have been enforced. But let us never be led by the argument that coal is inefficiently consumed to forget that there is a dire shortfall in output for which nobody but the N.C.B. can be held responsible. Furthermore, those who demand a free market price for coal must accept the fact that both the gas and electricity industries are persistent and confirmed sellers of cheap power and they too would have to be brought into line. Nor let us forget that to price coal "economically" will give the N.C.B. such a handsome profit that the miners will want a tidy wage increase. And who is to say that the N.C.B. could not afford to pay? It is hard to resist the feeling that to price coal yet higher would lead to a building in of an even higher cost structure so that the N.C.B., in a short time, would be in just as bad a case but at a higher level of operating costs.

It is true that to raise the price would be to cut the demand and to cut the demand would give the N.C.B. a chance to concentrate on economic as against all-out production.

But what is really required is a relief from the intolerable pressure on the N.C.B. not by pricing its product out of the market for many willing consumers but by having at hand alternative sources of power. What are these alternatives?

First, of course, there is nuclear energy and every hope must be pinned to its early arrival. But the government cannot press on too ostentatiously to their programme without strengthening the miner's already strong tendency to go ca'canny. There is, too, the danger, in pressing ahead with construction while many problems of fundamental research remain unsolved, that Britain may be saddled with a string of high cost nuclear power stations just as she was once saddled with an antiquated steel industry simply because she happened to get in first. Almost daily the estimated cost of nuclear power is revised downward by the experts and Sir John Cockcroft is reported to have given a fresh and cheaper cost estimate in Lisbon in the past week. That is a danger, however, which cannot divert the government from its programme. Even so nuclear energy, on a substantial scale, is probably still ten years off.

What of the immediate future? First there is the distinct possibility of importing cheap refrigerated natural gas if safe tankers can be devised. Secondly, there is the possibility of laying a cross channel electric cable. This would not allow for a heavy flow of imports but it would lead to a more economic use of power plant on both sides of the channel with immense financial savings on a small volume of exchanges. Neither possibility can "solve" the immediate power shortage.

The government and the N.C.B. are indeed in an unenviable position. In the long run (i.e. when nuclear energy is available in quantity), and in the less pressing circumstances thereby produced, the N.C.B. will no doubt be able to concentrate on development work and on mining economic pits. It should then be able to restore the good name of the British coal mining industry. But in the short run there is no obvious solution. The drastic solutions—such as letting the coal price rip—might effect a cure; yet they are just as likely to bring the industry into chaos. The alternative is to play for time; make minor adjustments in commercial policy as shifting circumstances demand; keep the miners sweet; and keep the powder dry. It is the alternative that the government seem likely to choose. It is not a path that can be trodden proudly, but it may be the only one that does not lead over a precipice.

Preliminary Work on Kariba

The Kariba Gorge hydro-electric power scheme in the Federation of Rhodesia and Nyasaland has been widely reported in *The Mining Journal*, and in our issue of June 10, 1955, it was pointed out in a discussion on the Kariba Report that enough was now known of the river and the sites concerned for work to begin immediately.

It is now reported from Rhodesia that proposals made by M. Andre Coyne, the French hydro-electric power expert, have been implemented and that preliminary work will begin at Kariba before the coming of the rainy season this year. In acceptance of M. Coyne's suggestions, that work begin as soon as possible, the Federal Hydro-Electric Board has entered into a contract with The Cementation Co. Ltd. without first calling for tenders.

The work involved, which is to begin about the middle of this month, will enable the Zambezi to be diverted and includes the excavation in rock of a diversion channel on the north bank. The initial operations will also include the construction of a tunnel through the rock on the south bank and the construction of two cofferdams. The cost of these immediate projects will be approximately £1,500,000, or three per cent of the estimated entire outlay.

At a press conference in Salisbury on June 29, the chairman of the Board, Mr. D. L. Anderson, said that the time involved in calling for tenders would have been 22 weeks, which would have meant that no work could have been achieved in the present dry season and that a year of work on the project would therefore have been lost. Mr. Anderson also announced the appointment of Messrs. Merz and McLellan, of London, as the consulting electrical and mechanical engineers at Kariba.

It is estimated that eventually there will be a township at the Kariba dam site with a population of 10,000 people, 1,500 of whom will be European families. Even after the construction of the dam has been completed, a permanent township will remain.

In the meantime, during the critical period before the Kariba scheme comes into operation, the Copperbelt mines will be supplied by power line from the Congo. The Rhodesia Congo Border Power Corporation, a wholly-owned subsidiary of Rhodesian Selection Trust and Anglo American Corporation, negotiated the deal with the Belgian Congo Government and Union Minière du Haut Katanga, which operates an extensive hydro-electric system for its mining activities. The Power Corporation's investment in this scheme amounts to "many millions of pounds".

Power will be supplied from the Le Marinel power station now being built on the Lualaba river, and the Belgians are building a line from Elisabethville to Jadotville which will link up with the Corporation's line at the border. The line, carried on pylons 75 ft. in height, will be the longest and highest voltage transmission line in Africa. The date of completion is set at March, 1956, and the mines of the Copperbelt will receive their first power from the new source by the end of that year.

Western Australian Review of 1954

The President of the Chamber of Mines of Western Australia emphasized salient features affecting the gold mining industry during 1954 in the course of his address at the Annual Meeting. Production for the year was 3,240,378 l.tons of ore and recovery was 361,992 l.oz. of gold, an increase of 70,503 tons and 38,661 oz.; recovery per ton was 5.32 dwt. compared with the previous 5.19 dwt., the increase being due to increased production of one high grade producer.

Industrial matters were an important feature of the year. Applications by all unions concerned in the gold mining industry for increased margins were granted by the State Arbitration Court. The Chamber of Mines applied for reconsideration of the Industry Allowance and the Court granted a reduction from £2 per week to 35s. per week, and the existing formula was set aside. The Industry Allowance is now pegged at 35s. and there will be no future variation except as a result of application to the Court.

The fixing of the present margin between skilled and unskilled labour has been assessed on the margin which existed in 1937, and the President considered that a wiser course would be to assess a true margin between skilled and unskilled labour without relation to margins which existed many years previously. With the continual rise in the Basic Wage, the gap hitherto existing between lower and higher paid positions in the industry must close to some degree. The Court's efforts to preserve percentage margins must cause a cycle as vicious as the Basic Wage-cost of living cycle has been in the past. The reduction and pegging of the Industry Allowance is simply an arbitrary figure in no way related to the comparative prosperity in 1934 and that at the present time. Some apprehension has been caused by an intimation by the Court that, under certain circumstances, adjustment of the rates of lower paid

workers would have to be considered. As the present Basic Wage still contains prosperity allowances that more than cover any increases that have taken place in the past two years it is considered that any adjustment would not only be unjustified but would tend towards an inflationary cycle.

A disturbing feature caused by the fixed price of gold is that large tonnages of low grade gold ore are being left in mines and will never be recovered, a very adverse factor in the national economy, a position that can be rectified only by a straight subsidy per oz. of gold produced or by a satisfactory increase in the price of gold. Economies will be effected by the amalgamation of companies that have taken place on the Golden Mile during the past year and will tend to prolong the life of the Field. The really disturbing factor in the industry is that no new mines are being found to replace those which must go out of production.

Canada

(From Our Own Correspondent)

Winnipeg, July 8.

Railway construction to the centre of activity in the new Manitouwadge Lake area of Northern Ontario is nearing completion. The Canadian National Railway will make its first freight deliveries to the new mining field about mid-July, and this will be followed by completion of a second line by the Canadian Pacific Railway within the next sixty days. Meanwhile, Geco Mines Ltd. is pressing forward with development and construction designed to place the property in production by April, 1957, at an initial rate of 3,300 tons daily. Ore so far indicated in the copper-zinc-silver deposit has been estimated at 15,000,000 tons.

Gunnar Mines at Lake Athabasca will complete mill construction within the next two months, designed to treat 1,250 tons of uranium ore daily. Initial production will come from an open pit of possibly 1,600 ft. by 600 ft. and to a depth of 400 ft. In the preparation of this open pit some 2,000,000 tons of rock capping and overburden has been removed, and with a further 3,000,000 tons to be removed accordingly as development proceeds. Meanwhile a main working shaft is to be sunk through which development will be undertaken in the mineralized area lying between 400 and 1,300 ft. in depth. The cost of bringing the mine into production will reach approximately \$20,000,000. The company has a contract for the sale of \$76,000,000 of uranium (minimum) before 1962. Output is expected to be at a rate of around \$15,000,000 annually.

COMPETITION FOR LABOUR

Competition for labour is developing in the Canadian mining fields thereby increasing the difficulties under which the gold mining industry is operating. With the price of gold fixed there is little hope of wages being increased to any important extent at the gold mines. Employees are aware of this and there is a growing tendency to seek jobs in the newly developing base metal camps as well as in the new uranium mining fields.

Consolidated Denison is taking on increasing magnitude among the uranium mines of Canada. Based upon expectations that work centred on about ten per cent of the area of the property would reveal about 10,000,000 tons of ore, provision was made some time ago for \$22,000,000 with which to develop and equip the mine for production. However, ore tonnage is exceeding expectations by about fifty per cent. As a result, arrangements have been made to provide \$37,000,000 and to build a plant with an initial capacity of 5,000 tons of ore daily. Financing has been

arranged in the form of \$22,000,000 in debentures bearing five per cent interest, together with \$15,000,000 advanced by the company's bankers at 4½ per cent interest. The outlook is that when Consolidated Denison goes into production, the output may be at an average rate of approximately \$100,000 per day—this prospective initial production rate of \$3,000,000 monthly being difficult to match anywhere in the world in the annals of mining. Two shafts, each of five-compartments, and situated 2,500 ft. apart will provide access to the underground and will establish outlet for 8,000 tons of ore daily.

Sherritt Gordon Mines in Northern Manitoba has attained a rate of output far in excess of earlier estimates. This applies to the company's refinery at Fort Saskatchewan as well as to the mine itself. The indications are the refinery will produce at a rate of some 20,000,000 lb. of nickel annually. Added to this is the further output of about 1,000,000 lb. of nickel monthly from the sale of surplus concentrates to International Nickel. A new line 160 miles in length has been built by the Canadian National Railway for the special purpose of serving the Sherritt Gordon mine.

Exploration has shown that large dikes of spodumene are widespread throughout Canada, and especially so in Quebec, Ontario and Manitoba. The outlook is that if lithium is to come into increasing use, the newly developing mines in Canada will occupy an important place in this comparatively new branch of the mining industry. Among recent properties on which large deposits of spodumene have been revealed are those owned by Conwest Exploration and Nama Creek, in the Port Arthur and Lake Nipigon area of North-Western Ontario.

Portugal

(From Our Own Correspondent)

Foz do Douro, June 27.

A comparison of the values of exported mineral products shows that the value of cupreous pyrites is almost equal to that of tungsten-bearing minerals. Cassiterite exports are almost non-existent while simultaneously exports of tin metal decrease month by month.

It is anticipated that local consumption will absorb domestic output when the projected tin plate plant, referred to in *The Mining Journal* of May 27, 1955, has been brought into production, and at the moment discussions are proceeding as to the precise locality of the envisaged plant. Both the northern and southern portions of the country desire to accommodate the plant, yet in each case the localities advocated by the contending parties are far removed from the sites of the cassiterite deposits and the iron producing areas.

The export figures for the period January-March are (in tonnes): WO, United States 164, United Kingdom 405, Germany 290, Austria 10, Holland 30, Sweden 31; cassiterite, United States 15; cupreous pyrites, United States 300, Ireland 1,770, Germany 18,690, Belgium 22,815, France 33,681, Holland 35,645, French North Africa 2,060; tin metal, United States 10, Finland 10, Others 8; and haematite 20,291, magnetite 7,880, manganese 5,431, white arsenic 327.

The following are the production figures for January-December, 1954 (in tonnes): beryl 301, lead 2,909, precipitate of copper 122, columbium/tantalum 25, chrome 21, cassiterite 1,462, mixed Sn/TiO₂ 5, mixed Sn/WO₃/Ca 45, lithium 9, manganese 9,591, molybdenum 1, scheelite 172, wolframite 3,686, haematite 83,104, magnetite 25,326, white arsenic 1,324.

COLUMBITE—VI

Separation of Columbite by Sieving Unit

By J. HURST

Waste dumps on tin mining sites have for long been known to contain considerable amounts of columbite, although the separation of this columbite from the mass material has until recently been regarded as uneconomic. Despite the fact that a unit for the separation of almost any predetermined metallic ore recently has been produced, only material fed in particles of like size could be treated, and no sieving machine could be found which effectively dealt with powdered columbite owing to the particular form of the particles. A machine has now been produced by Russell Constructions Ltd. which will efficiently sieve columbite. The unit is described in the following article by the managing director of the company.

Wherever deposits of tin occur so do also many other valuable ores, and in some districts one of these takes the form of columbite.

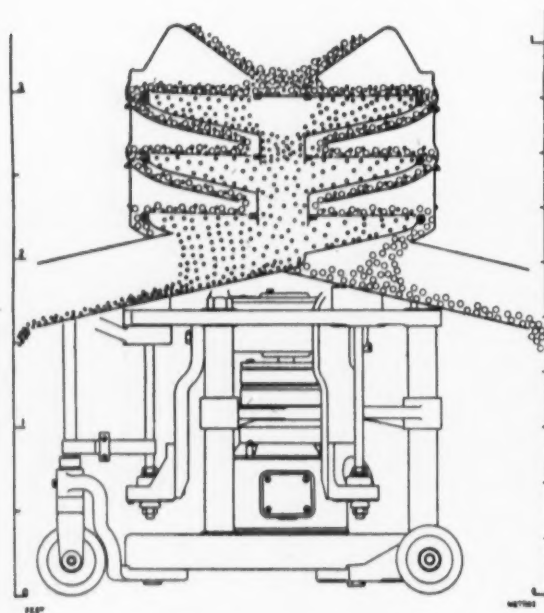
Columbite is a niobate of iron and manganese and is the largest source of columbium (niobium), which is all important in the manufacture of electric light filaments, jet engine components and certain atomic equipment. It is worth about £2,000 per ton.

A NEW MACHINE

Although it has long been known that the dumps of refuse material on some tin mining sites contained large quantities of columbite, no means could be found whereby this columbite could be separated from the surrounding material at a profitable rate in spite of the fabulously high price that could be obtained for the ore. Great interest was therefore evoked recently, when a machine was placed upon the market by means of which almost any predetermined metallic ore could be separated.

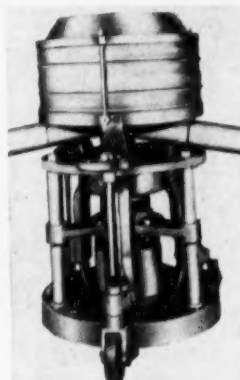
However, this new separator has one essential limitation, inasmuch as that it could only treat material which had been reduced to a powder of particles all of like size.

At first glance, this would appear to offer no real difficulty, since the process of sieving usually constitutes a ready means of sizing out particulate matter, and, in fact, most ores do lend themselves readily to this treatment.



KEY: — — Mesh Surface o Rejected Particles * Fines

Sieving principle adopted in the Russell unit



The Russell Stand Cascade Continuous Rejection Sieving unit

Unfortunately, the ore columbite proved to be an exception to this rule. No sieving machine could be found which could effectively deal with powdered columbite, the reason for this being attributable to the curious form of the columbite particles which are mostly shaped like minute carrots.

As is well known, a sieving machine usually takes the form of a rectangular tray dressed with a suitable wire mesh or screen and this assembly is caused to vibrate either backwards and forwards or else up and down at a high speed. This motion causes the particles of the powder to bounce about upon the mesh surface. Thus the particles that are small enough will pass through the mesh and under ordinary circumstances those that are too large to pass the mesh aperture will continue to bounce over the screen until they pass off via the reject outlet.

In the case of columbite, however, this does not happen owing to its curious particle shape.

The minute carrot-shaped particles of columbite, when caused to jump about on the vibration sieving screen, will tend to enter the apertures pointed end first. Other bouncing particles will descend upon these and hammer them firmly home. This sequence, happening hundreds of times per second, will very quickly cause the mesh screen to become packed solid with wedged-in particles so that no further sieving can take place, and the whole assembly will have to be dismantled and cleaned before further operation becomes possible.

It is indeed a fact that many mine operators have preferred to resort to the expensive and laborious process of hand sieving sooner than face the difficulties and delays involved in any attempt to perform this process by mechanical means.

SIEVING BY GYRATORY MOTION

In an attempt to solve this problem, one of the leading tin mine owners of Nigeria approached Russell Constructions Ltd. These manufacturers have had much experience in sieving and straining techniques, particularly during the recent war when the mass production of explosives involved the high speed sieving of many dangerous and sensitive compounds.

Indeed, a machine had originally been designed by Messrs. Russell for the sieving of tracer bullet powder that was adapted to the classifying of columbite. In this unit the vibrations which promote the sieving effect are of a

gyratory nature, that is to say, the mesh screen is caused to move in a minute circular orbit (this motion usually has an amplitude of about 3/16 in.) and at the relatively high speed of 1,500 cycles per min. The movement takes place in a strictly horizontal plane and has the effect of generating in any particulate matter placed upon the screen an entirely unique type of motion.

When applied to columbite, the carrot-shaped particles are imbued with a dual motion. They rotate on their longitudinal axes and at the same time turn end over end, yet all the while all bouncing movement is strictly eliminated. Special instruments have made it possible to observe the impact of this effect at the mesh surface during the operation of the machine, when it was shown that the spinning motion helped the carrot-shaped particles to pass readily through the screen apertures, while the end over end movement rendered it impossible for any material to stick in the mesh and cause blinding.

Amidships in the machine is the circular housing which contains the flywheel that generates the gyratory move-

ment. A $\frac{1}{2}$ h.p. electric motor supplies the power. The screening assembly is mounted in compressed rubber bushes, and takes the form of the Russell's Cascade unit. In this there are three circular screens superimposed one above the other, the whole assembly being housed in a dust tight casing measuring 22 in. in dia. and 11 in. in height. The mesh discs are 19 in. dia. with combined area 6 $\frac{1}{2}$ sq. ft.

The columbite powder is introduced at the top of the unit and the gyratory motion causes the material to take a spiral path passing successively over the three discs. The fine particles which pass through the mesh apertures travel down the central duct of the machine and issue from the spout on the right of the unit, while the oversize material which passes over the edge of the discs is collected and passed off via the reject outlet spout on the left of the unit.

In practice these machines have proved highly successful. A very accurate and thorough separation of the sized particles takes place, and the machine calls for minimum maintenance and even complete remeshing of the screens can be completely carried out by unskilled labour.

DEEP MINING—II

Rock Bursts in Ultra-deep Areas of the Central Witwatersrand

The problem of rock bursts appeared long before the ultra-deep levels of the Central Witwatersrand were reached, and despite the adoption of the recommendations made by the Commission of Inquiry appointed by the South African Government in 1924, rock bursts still constitute one of the most disturbing factors associated with ultra-deep level mining operations. The following article, the second of a series of three, describes the effect of rock bursts, assesses the results of investigations into the cause, and discusses the modifications in mining practice which have been introduced in an effort to reduce the hazard. This series is condensed from a paper entitled *The Exploitation of the Ultra-Deep Areas of the Gold Mines of the Central Witwatersrand*, presented by F. G. Hill, a consulting engineer for Central Mining and Investment Corporation Ltd., at the Centenary Congress of the Société de l'Industrie Minière held in Saint-Etienne from June 16 to June 18 and in Paris from June 18 to July 3, 1955.

A rock burst may be defined as a sudden rupture of solid rock *in situ* in which movements into the excavation result from forces other than or in addition to the dead weight of the rock that has moved. Falls of rock unaccompanied by violence are not regarded as rock bursts. To obtain a picture of the nature of rock bursts in the mines of the Central Witwatersrand, a severe burst will be described which occurred in an ultra-deep level mine where a serious and extensive burst recently occurred. The stopes and drives were badly damaged, and took several days to clear.

The burst area extended from about 90 ft. above 49 level

drive to about 220 ft. below it, over a width varying from 30 ft. to 70 ft. from the face, the drive itself being affected for a distance of about 100 ft. back from the face. Other areas which were affected by falls of hanging included portions of 48 level drive.

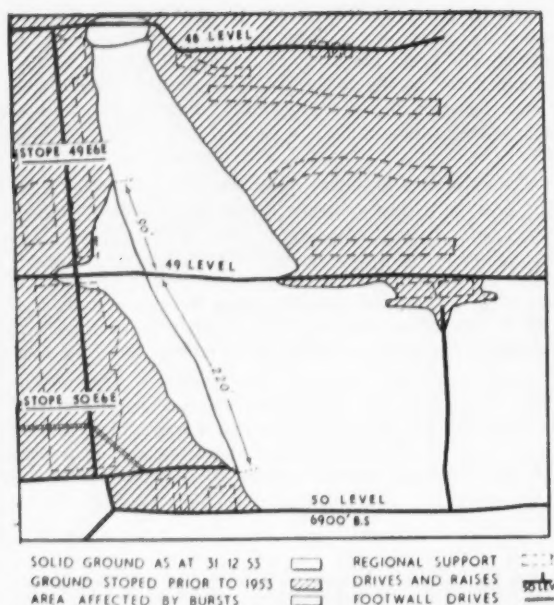
Within the actual burst area the face appeared undamaged over its entire length, but considerable, violent closure had taken place with the result that the timber pack supports were either shattered or kicked out of position. In stope 49 E. 6 E. the stoping width was reduced from 48 in. to an average of about 8 in., except for



Part of the stope 60 ft. below 49 level in the Angelo section, E.R.P.M., showing fallen hanging, traces of deep fracture planes and a shattered mat pack. The stoping width of 4 ft. has been reduced to about 18 in. at this point



Damage from a rock burst in a deep haulage on City Deep, where the haulage passed beneath a peninsula abutment. The haulage at the centre of the burst is shown after being partially re-opened. Damage to side walls was most severe



The two stopes on E.R.P.M. where a serious rock burst occurred recently. In these stopes, the drives and raises are on reef

an area roughly 40 ft. by 40 ft. immediately above 49 reef drive and next to the face, which was completely closed. In stope 50 E. 6 E., where the stoping width was about 41 in. prior to the burst, the amount of closure varied from 8 in. to as much as 38 in.

COMBINED MOVEMENT

Careful examination of the nature of the burst revealed that the closure was due to both hanging and footwall movement. That the footwall had risen was revealed by the fact that slabs of quartzite of from 4 to 6 in. wide and several ft. long, between the normal fracture planes in the footwall, had been squeezed up several inches into the excavation. This upward movement of the footwall was not uniform throughout the burst area and seemed to have occurred in patches. Holes which had been drilled into the face immediately before the burst, and which were at a very much smaller distance above the footwall after the burst, provided further evidence of relative movement.

In so far as the hanging-wall is concerned, it was much more difficult to find convincing evidence that it had moved or to determine the amount of movement that had taken place. However, the amount of relative movement between face and footwall, which could be determined with a reasonable degree of accuracy at a number of points at the face, did not account for the total amount of closure in the burst area, so that sag of the hanging wall must have occurred. In this connection it should be noted that although there was no definite evidence of relative movement between hanging wall and face in the plane of the face, freshly formed rock powder in the fracture planes of the hanging running parallel to the face suggested relative sliding along these planes during hanging settlement.

From an analysis of the movements that have been described, it seems reasonable to suggest that the face abutment had punched into the footwall, resulting in a footwall rise and a general hanging-wall settlement. Intense fragmentation of the rock that has burst out is a feature, indicating the violence of the phenomenon of rock bursts.

The extent to which a mine on the Central Witwatersrand suffers from rock bursts depends on many factors, but

perhaps the most important is the percentage payability of the ore. Experience has shown that if 50 per cent or more of the reef is left *in situ* the incidence of bursts is small because the degree of stress in the solid rock is not sufficiently high to cause rupture.

None of the ultra-deep mines of the Central Rand are entirely free from rock bursts, however, and such figures as are available show that the incidence of rock bursts on the more highly payable portions of the mines varies from 0.5 to 3 rock bursts per 1,000 sq. fathoms stoped, a sq. fathom being 36 sq. ft. Large mines stope many thousands of sq. fathoms per month from the ultra-deep areas, so that the number of bursts occurring in the course of a year may be considerable.

Records kept on one of the large ultra-deep-level mines over the last six years, for example, showed that 694 rock bursts had occurred. They are thus a source of constant anxiety and must be regarded as the most serious of the obstacles confronting the ultra-deep mines which have large zones of ore with a high percentage of payability. As has been shown, the heat problem may be met by installing fans and refrigerating units, but the rock burst problem will not likewise yield to money spent on machinery. The hope does exist, however, that by spending money on research we might gain greater understanding of the mechanism of rock bursts and thus be in a better position to overcome this intractable problem.

MODIFICATIONS IN MINING PRACTICE

It has long been known that bursts were closely associated with the mining of remnants, and records show that with a type of scattered stoping over 90 per cent of the bursts in fact occur while mining remnants—a remnant being arbitrarily defined as an island of unmined ground which is less than 1,000 sq. fathoms in area. The formation of remnants is a controllable factor, and the trend in highly payable areas of ultra-deep mines is thus to resort to longwall stoping. Two forms of longwall stoping have met with a fair measure of success. Thus on one large mine where longwall stoping was adopted the pressure bursts decreased from 2.8 to 1.5 per 1,000 sq. fathoms stoped.

Longwall stoping has thus ameliorated but has not solved the problem. Further progress, however, is in sight, and the belief is growing that the shape and locality of the abutments have a big bearing on the incidence of bursts, an abutment being defined as rock *in situ* taking thrust. Careful recording is showing where and how potentially dangerous mining situations are being created. The following table, which was compiled from records kept on one mine over many years, is indicative of the importance of different types of abutment.

Operation	Total sq. fms. Stoped	Incidence of Rock Bursts	
		No.	No. per 1,000 sq. fms. Stoped
Stoping out by 33 remnants			
abutments	29,000	118	4.1
Scattered Stoping	85,000	241	2.8
Acute peak abutments	47,000	128	2.7
Stoping in dikes	45,000	125	2.7
Overhand longwall stoping	85,000	185	2.2
Obtuse peak abutments	16,000	23	1.4
Underhand longwall stoping on continent abutments	77,000	88	1.1

Statistical analyses of this kind are of great help in planning sequence of stoping, for the figures show where the greatest dangers lie and which types of abutment should be created and which avoided. Other analyses that have been made show that the daily blast acts as a trigger in precipitating a burst, that faults and dikes are apparently zones of increased stress, and that a raise ahead of an advancing face increases the danger of the face bursting.

Geological Survey Activities in Tanganyika during 1954

The Annual Report of the Tanganyika Geological Survey Department for the year ended December 31, 1954, has been received and gives interesting highlights of activities in the Territory during the past year. An appreciable amount of systematic mapping was carried on in addition to many investigations of immediate importance.

Of particular interest is the pyrochlore deposit at Panda Hill near Mbeya, reported in *The Mining Journal Annual Review* as an important economic occurrence. This statement is reiterated in the Report. As was previously pointed out, approximately 9,500,000 tons of ore averaging 0.31 per cent Nb_2O_5 have been established as indicated on this site, although this tonnage is believed to be only a fraction of the total ore body *in situ*. Indeed, several mining companies have shown interest in Panda Hill, and mineral dressing tests were made on the ore by one of them during the year. In addition, a concentrate of pyrochlore extracted by the Tanganyika Geological Survey Department was submitted to smelting trials in England for the recovery of niobium and ferro-niobium, with favourable results. Laboratory investigations and smelting trials are still proceeding.

The Mineral Dressing Department was occupied throughout the year with various phases of a comprehensive survey into the recovery of pyrochlore from carbonatite. In addition, a method was worked out for the recovery of pyrochlore from the soils of Panda Hill, the distribution of niobium soils was studied, as were other local problems of mineral dressing.

Pyrochlore was also discovered at Ngualla, Oldonyo Dili and in the Rufiji region during the year.

In so far as radioactive minerals are concerned, a small amount of pitchblende was won from mica-pegmatites in the Uluguru mountains, although a special expedition to the region failed to locate any indications of workable deposits. Nevertheless, a specimen of pitchblende was found at the Nkungwe mica mine in the westerly portion of the Territory and another near Idibo.

Interest in rutile was evinced from overseas sources, and occurrences in beach sands and at the Fufu Scarp were investigated, with the result that the beach sands appeared to offer more cause for optimism. Indeed, the occurrence of magnetite, zircon and rutile in the sands of the Tanganyika coastline is known. A number of samples were examined during the year and the suggestion has been made that a small output of magnetite for certain purposes might be feasible.

Further work was completed on the known deposits of magnesite at Mwembe and in the Lugala Hills. Freshly discovered occurrences in the Pare mountains were examined, although the search for further deposits near Itiso were unsuccessful.

INTER-DEPARTMENTAL CO-OPERATION

The co-operation between departments was well proven by a report from the Veterinary Department that unusual concentrations of copper in the blood and organs of cattle had been noted in the Mpwapwa area. It was stated that this condition should be due to the relatively high content of copper in graze, in turn due to the high copper content of the soils derived from the rocks in the district.

These rocks for long have been known to show copper staining and traces over wide areas, despite the fact that no workable deposits have yet been found. Investigations on the Mpwapwa, Sango and Kigugwe occurrences were continued and a further programme of investigation was initiated in the Kigoma area.

During the year a search was made for tin in those rock formations and districts hitherto insufficiently prospected, and a report was prepared on the methods of prospecting for certain types of deposit. Tin was detected and confirmed by laboratory examination in the pyrochlore-bearing rocks of Panda Hill, while detailed geological and laboratory work were undertaken on a deposit in Karagwe in an effort to improve output and efficiency of production.

Further examination was made of two localities from which minerals of the columbite-tantalite group have been reported, but the venture was unsuccessful. Although columbite has not previously been noted in carbonatites in Africa, it was detected as an accessory mineral in the carbonatites of both Ngualla and Panda Hill. At the same time attention was given to the possibility of outlining new areas for gold prospecting in case this is required, and laboratory assistance was given to various operating gold mines. A gold-telluride was noted in a gold ore from the Lupa goldfield, the first recorded occurrence of this mineral in Tanganyika.

OTHER ACTIVITIES

Other general activities were completed during the year. Geological work in the Uluguru mountains indicated that part of the area is not unlikely to contain bauxite although there has been no opportunity for active prospecting as yet. Prospecting for beryl near Itiso was unsuccessful while examination of occurrences of the chromium minerals has been of considerable technical interest but has not yet led to any finding of economic interest. Much attention is being paid to kyanite, particularly by African prospectors, and many occurrences in the Pare mountains have been examined. Few of these, if indeed any, are of high grade, although one is the subject of current laboratory work. Traces of palladium were discovered in a rock from the ultrabasic body at Ngasamo, which also contains nickel and chromium.

Geophysical work was carried out on the deposits of nickeliferous magnetite at Itiso and it appears that trial drilling might be justified. It is apparent from the report that geophysical activity was comparatively widespread, and some magnetic traverses were carried out over the body of basic rock at Itiso with the result that an intense local anomaly was revealed at one point. A Worden gravimeter was in use at the end of the year on an investigation into the nature of the deposits underlying the alluvial areas south of the Uluguru mountains.

This comprehensive report points out in conclusion that a wide variety of mineral deposits was examined and reported upon during the year. If a prospect appeared to warrant careful investigation it was mapped, pitted and sampled and, in some cases, drilled. If the prospect appeared valueless, on the other hand, it was nevertheless briefly mapped and described in order to prevent unnecessary future re-examination.

Coal Preparation Plant at Nantgarw Colliery

Two of the most important changes which occurred in the character of raw coal as a result of mechanization were an increase in moisture content and an increase in ash content, particularly in the finer sizes. The coal preparation plant at Nantgarw Colliery is installed to provide a high-quality coal of uniform ash content with a minimum of moisture for use in the Nantgarw coke ovens for producing metallurgical coke. The plant, which is described in the following article, is the second to be commissioned capable of dealing with the entire run-of-mine output by the Chance and froth flotation processes only. The plant, developed by Fraser and Chalmers Engineering Works of The General Electric Co. Ltd., is claimed as unique and two similar installations already have been commissioned by the N.C.B. at Crwm and Cyheidre collieries.

The problems involved in adapting the Chance process to the new conditions concerned the development of some means of extracting the 1/16 in. x 0 fraction from the raw coal feed when the latter had a moisture content in excess of 10 per cent, and of successfully cleaning the 1/16 in. x 0 fraction in a single process. The successful surmounting of these difficulties would result in a two-process plant for cleaning the whole of the run-of-mine output from a colliery.

Nantgarw Colliery is in the No. 5 area of the South Western Division of the National Coal Board. The Ministry of Fuel and Power approved a reorganization scheme in 1946 and, following developments underground, the contract for the coal preparation plant was placed with Fraser and Chalmers Engineering Works of the General

Electric Company Ltd. The contract was placed in 1950.

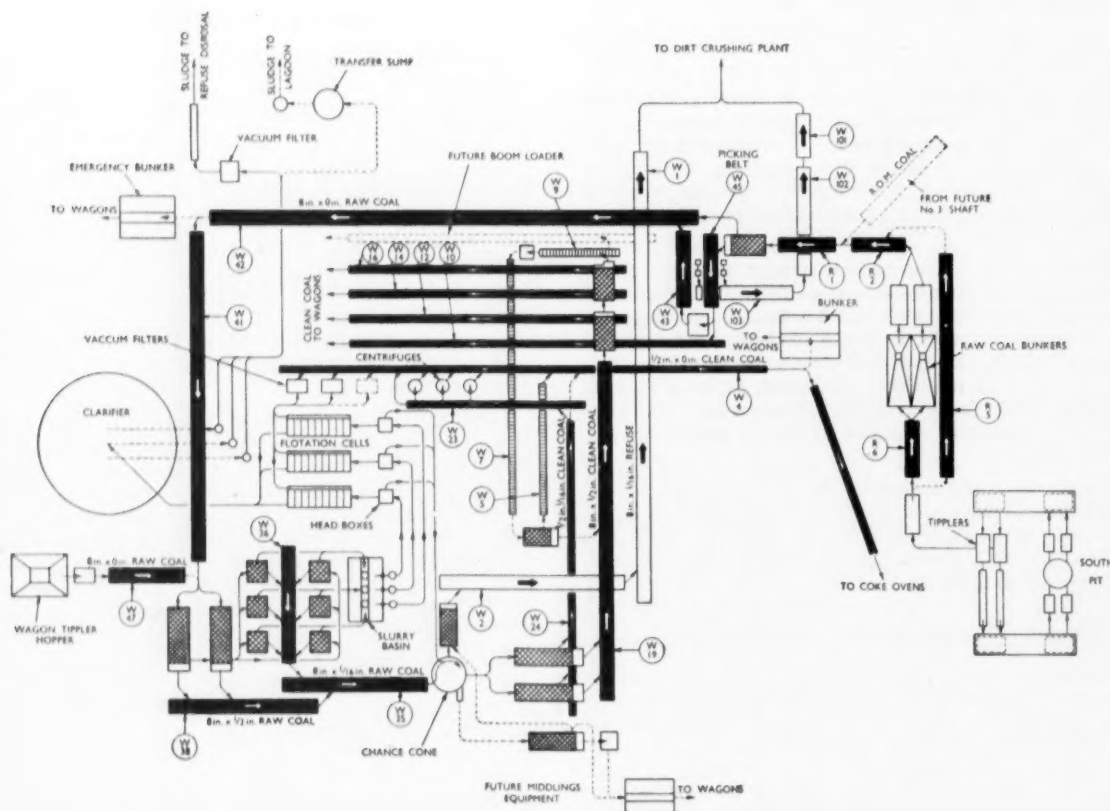
The average dip of the coal seams at Nantgarw is 37 deg. and, in view of this, it was decided to adopt the principle of horizon mining. The run-of-mine coal handling equipment has been laid out in such a way that a third shaft, to be fitted with four cages, may be installed in the future so that the gross output from the colliery may be increased to 8,000 tons a day.

The flow of raw coal from the blending bunkers is controlled by means of two Sherwen electro-magnetically vibrated feeders which deliver the raw coal on to conveyor R.1, via conveyor R.2. Conveyor R.1 discharges the run-

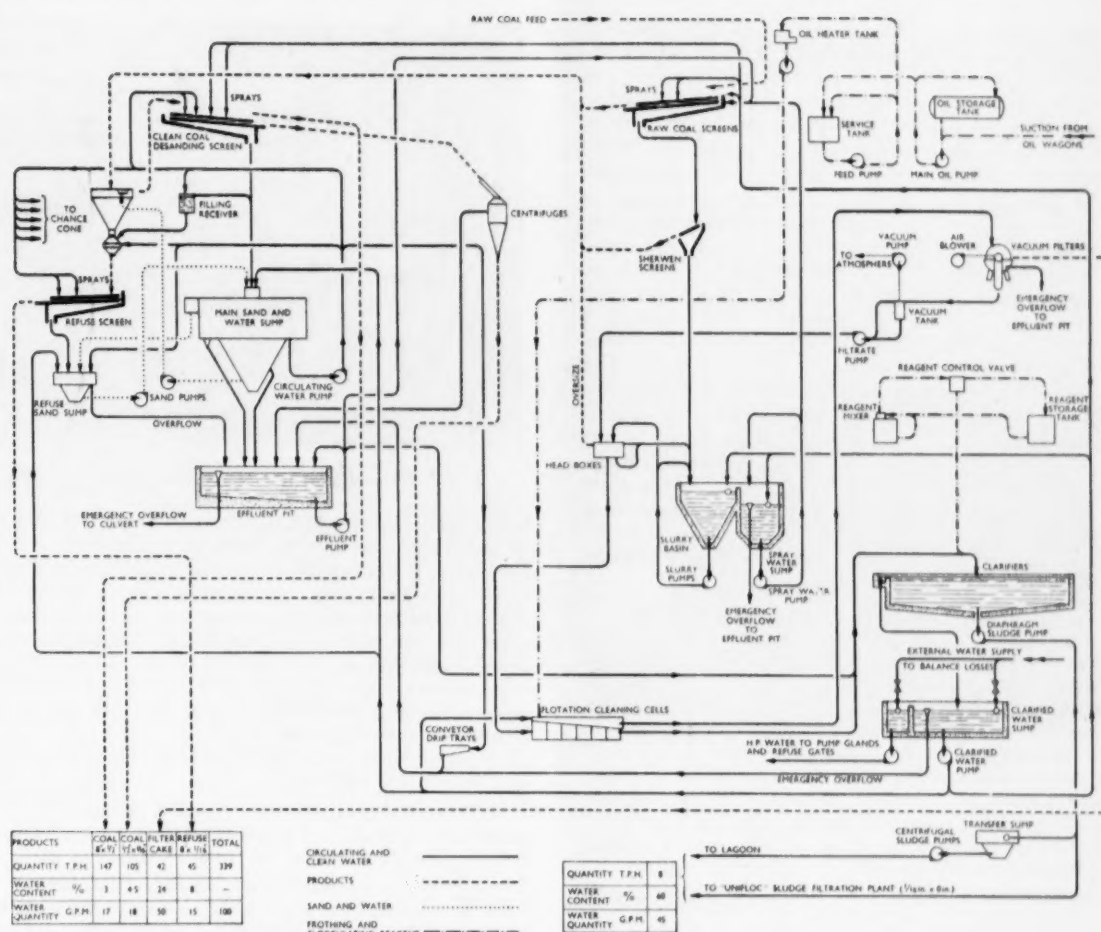
of-mine coal on to the primary raw coal screen for a separation at 8 in. round, the minus 8 in. fraction passing to conveyor W.42 while the plus 8 in. fraction is delivered on



The exterior of the Nantgarw coal preparation plant



The coal flow diagram



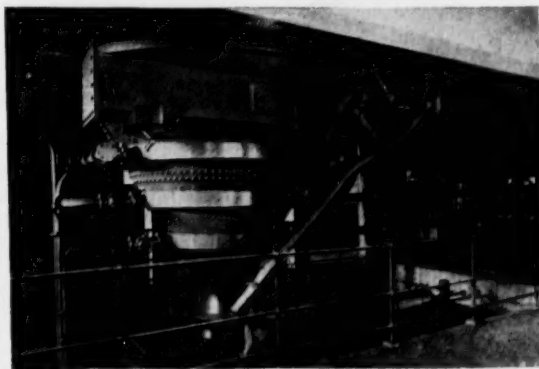
The water flow diagram

to the picking belt W.45. All the 8 in. x 0 raw coal passes to conveyor W.42, from which it is delivered to conveyor W.41. The discharge chute of the former is fitted with a by-pass, however, so that in an emergency 8 in. x 0 raw coal may be off-loaded to wagons, via a 25-ton capacity bunker. Coal loaded out in this way may be reintroduced into the plant by means of a Marshall type wagon tippler and belt conveyor W.47.

Conveyor W.41 delivers the 8 in. x 0 raw coal on to a pair of secondary raw coal screens, where it is separated with the aid of spray water into 8 in. x $\frac{1}{2}$ in. and $\frac{1}{2}$ in. x 0. The latter fraction is laundered, with the aid of the spray water added on the secondary raw coal screens, to a battery of six Sherwen electro-magnetically vibrated screens for further wet screening into $\frac{1}{2}$ in. x $\frac{1}{16}$ in. and $\frac{1}{16}$ in. x 0. The 8 in. x $\frac{1}{2}$ in. fraction is delivered to the Chance washing cone via conveyors W.35 and W.38, together with the $\frac{1}{2}$ in. x $\frac{1}{16}$ in. size from the Sherwen screens via conveyor W.36. All the spray water, added on the secondary raw coal and Sherwen screens, which contains

the $\frac{1}{16}$ in. x 0 fractions of raw coal flows into the slurry basin from which it is pumped to the froth flotation plant.

The Chance cone, which is 15 ft. in dia., is suitable for a single gravity separation with products of clean coal and refuse. The connection on the cone for the middlings tube is illustrated. This connection has been blanked off for the time being and the middlings tube can be fitted in a short time without structural alterations to the washing equipment. This facility of being able to add middlings equipment cheaply and easily to a Chance cone, is one of the many advantages of the Chance process.



Base of Chance cone

The refuse extracted from the Chance cone is desanded and dewatered on a shaker type screen and the clean coal is also desanded and dewatered on two shaker type screens which also separate it into 8 in. x $\frac{1}{2}$ in. and $\frac{1}{2}$ in. x $\frac{1}{16}$ in. for delivery. Prior to its delivery on to the sizing screen the crushed coal, 4 in. x 0, is passed over a Sherwen screen for the extraction of the minus $\frac{1}{2}$ in. fraction.

The $\frac{1}{2}$ in. x $\frac{1}{16}$ in. fraction of clean coal separated from the 8 in. x $\frac{1}{2}$ in. size on the desanding and dewatering

screens is delivered on to conveyor W.24. The discharge chute of this machine is arranged so that in normal circumstances the $\frac{1}{2}$ in. x $\frac{1}{16}$ in. clean coal is delivered to two of the three Rheolaveur Reineveld centrifuges for dewatering. By adjusting the flopper valve of the discharge chute of conveyor W.24, the $\frac{1}{2}$ in. x $\frac{1}{16}$ in. clean coal may be fed directly on to conveyor W.4 for disposal without dewatering.

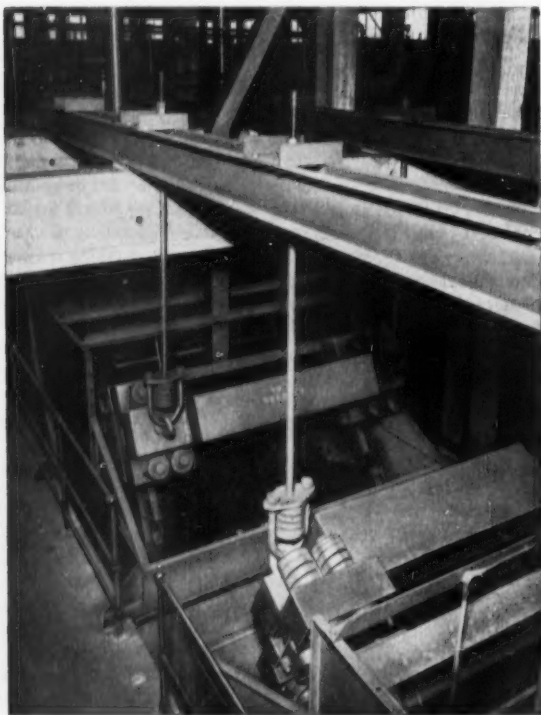
The distribution of the feed to the three centrifuges is facilitated by means of a scraper conveyor. Any two of the three centrifuges are normally in operation, the third serving as a standby. After dewatering, the $\frac{1}{2}$ in. x $\frac{1}{16}$ in. clean coal is discharged on to conveyor W.4, where it is joined by the $\frac{1}{16}$ in. x 0 filter coke. This conveyor is fitted with a discharge chute to deliver the $\frac{1}{2}$ in. x 0 mixture either to the conveyor feeding the coke works blending bunkers or to wagons via a 50-ton capacity bunker.

The $\frac{1}{16}$ in. x 0 fraction of the raw coal feed is laundered, together with all the spray water added on the secondary raw coal and Sherwen screens to the slurry basin. The latter serves as a reservoir for starting up the froth flotation plant at the beginning of a shift, besides evening out the quantity and the washing characteristics of the $\frac{1}{16}$ in. x 0 raw coal before it is delivered to the flotation plant.

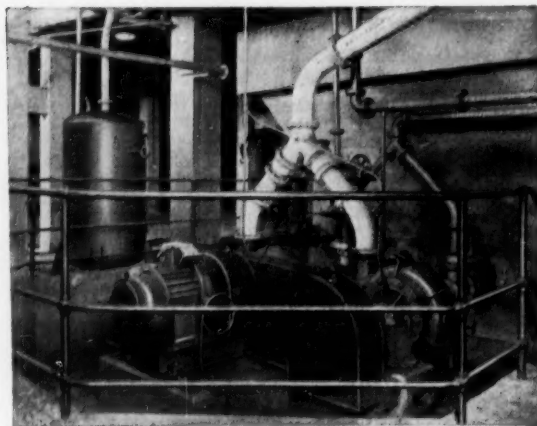
THE FLOTATION PLANT

The feed to the flotation plant is controlled by means of the head boxes to which the $\frac{1}{16}$ in. x 0 raw coal slurry is pumped from the slurry basin by means of three pumps of special design. Besides controlling the volumetric flow to the flotation plant, the head boxes also separate any over-size material (i.e. above $\frac{1}{16}$ in.) from the feed and deliver it to the Chance section of the washery. The flotation plant has a designed capacity of 60 tons an hour and consists of 628 cu. ft. of flotation volume in a bank of eight cells of the Mineral Separation pattern.

The treatment of coal below $\frac{1}{2}$ mm. in size had, of course,



Sherwen vibrating screen installation



Typical sand and slurry type pump

been a practicable proposition for many years. The purpose of the experiments with the pilot plant, therefore, was to ascertain if it was possible to increase the size range treated by froth flotation up to $\frac{1}{16}$ in., as the Chance process was already capable of treating coal down to that size. At the same time that work was proceeding on the pilot plant a series of experiments was carried out in the G.E.C. Laboratories at Wembley. As a result of all this work, it was found that coals which were amenable to froth flotation up to $\frac{1}{2}$ mm. in size could be successfully treated by this means up to $\frac{1}{16}$ in. in size, and the results obtained closely approached those expected.

Another important discovery was the fact that a larger quantity of $\frac{1}{16}$ in. x 0 could be handled by a given cell volume than was the case with $\frac{1}{2}$ mm. x 0.

In addition to the question of flotation of material up to $\frac{1}{16}$ in. in size, the practicability of dewatering it on vacuum filters and of dealing with it in thickeners also had to be considered, apart from the problem of extracting it efficiently from the raw coal feed when the latter had free moisture contents of the order of 10 per cent. Fortunately, the solution incurred no undue difficulties.

FEATURES OF CONSTRUCTION

The whole of the driving motors and the contactor type control gear for the plant was designed and manufactured at the Witton Works of the G.E.C. All the motors are of the totally enclosed, fan cooled, squirrel cage type and, with the exception of two, operate on a 500/550 volt, 3-phase, A.C. supply.

A considerable portion of the plant is sequence interlocked to avoid any complications in the event of a particular conveyor or screen tripping out. In order to avoid the inconvenience of a number of units tripping out in the event of another failing, the plant has been sequenced on the "family tree" principle. This arrangement has the advantage that a minimum of other units are tripped out if one fails, besides enabling the operators to start up different sections of the plant simultaneously without waiting for a number of other items to be started up first.

The main contract for the installation was placed with the General Electric Company Limited and include the whole of the mechanical equipment, the civil engineering work, driving motors and control gear together with the heating installation. The greater part of the mechanical gear was designed and manufactured at the Erith works. The electrical equipment was supplied by the Witton works of the G.E.C. and the lighting installation was executed under direct contract from the National Coal Board.

MACHINERY AND EQUIPMENT

The Application of Automatic Laboratories

In *The Mining Journal* of July 8, 1955, an article describing the displays of various manufacturers at the British Instrument Industries' Exhibition, 1955, made mention of the analmatic laboratories shown by Baird and Tatlock (London) Ltd.

In these days of increasing competition in both the home and overseas markets, the field of automation is of great interest. Because the laboratory stands behind the production line and controls the finished product, it is equally essential that the automatic laboratory shall be developed side by side with all other forms of automation. Another problem facing industry is the lack of qualified technical and scientific personnel. Routine laboratory processes are essential to large scale production but the expense to management of employing skilled and often highly paid scientists or technicians on routine work is not only uneconomic but prejudicial to future development. Technical brains can be employed more gainfully by being left free for original thought on future development.

The B.T.L. analmatic laboratories are intended to take over from the scientist problems of routine analysis. They can operate continuously, and as the fatigue factor is erased, the results obtained maintain a uniform degree of accuracy. On continuous working one B.T.L. analmatic laboratory could replace three skilled men each operating an eight-hour shift. In some instances, this factor may be increased.

An analmatic laboratory normally comprises one or more standard units which have each been developed to carry out a specific laboratory technique or to replace the muscular and thought processes of the human being generally employed to carry out such techniques. These units can be completely assembled, together with their power supplies and services, in standardized cabinets and interconnected in such a manner that the desired process is carried out and the result recorded without human intervention. The word "analmatic" has been coined to denote automatic analysis.

As an example, consider a pair of exactly similar analmatic laboratories designed to carry out continuous analysis of a liquor, sampled from four different sources, for a particular element. A measured volume of liquid sample is drawn from one of the sources in turn; to the sample is added measured volumes of two different reagents, after which the whole is reduced with hydrogen. Thereafter the liquid is examined in an absorptiometer and the result is recorded on a chart as concentration of the element in grams per litre of liquor. The recorder has two different ranges; the appropriate range is selected automatically depending upon the concentration of the sample being examined.

The units forming these laboratories are the left-hand bay; comprising graphic panel which indicates by means of coloured lights the position of the mechanism at any given moment in the operating cycle; master control unit; sequence unit; time pulse unit. The last two units control all the operations of the laboratory and indicate faults if and when such occur. Means are provided for easily tracing faults. Included also in the left-hand bay is the E.H.T. supply unit for the absorptiometer which, in this instance, employs a photomultiplier.

In the right-hand bay is a recorder unit; a metering and mixing unit, and an absorptiometer unit.

A Flameproof Gate End Box

The Scottish firm of W. & H. Nelson Ltd. have added to their range of mining equipment by the manufacture of a new design of flameproof contactor operated gate end box. The unit has already been tested in operation, and the manufacturers have begun production. Buxton certificates have been issued for the equipment.

Many of the latest N.C.B. specifications have been incorporated in the design, and the gate end box is a robust unit with a versatile list of applications for the control of various portable equipment used in mines. Fitted in a case of fabricated mild steel construction with removeable top cover and hinged front cover, it is mounted on channel type skids for

easy transportation. Other features of the gate end box are that it has an intrinsically safe remote control circuit, has solenoid type overload relays with oil time lags, and has a strongly constructed isolating switch.

A New Cromwell Fibre Helmet

A new mining helmet designed and manufactured by Helmets Ltd. is a pleasing advance on existing patterns for head protection in mining and quarrying operations. The unit, designated as a new Cromwell Fibre Cap, has a strength factor in excess of B.S.S. 2095/1954 requirements.



The new Cromwell fibre helmet

A greatly reinforced and scientifically designed crown gives maximum strength for minimum weight, while the corrugated form enables the lamp cable to lead neatly to the fastener. This cable fastener is designed to afford increased protection with the minimum of charging, and draught and drip-free ventilation at the front gives greater wearer comfort, an important factor in underground safety practice. The cradle is of approved design and the helmet manufactured from tested materials.

A Contract for Mining Equipment

Sheepbridge Equipment Ltd., a subsidiary of Sheepbridge Engineering Ltd., report that they have received an initial order for Sheepbridge mine cars from the National Coal Board for the Cynheidre New Colliery in the South-Western Division.

Cynheidre New Colliery is a new project and part of the larger organization scheme for the Welsh Coalfields. It is understood that the total requirement of mine cars at the colliery will be between 2,000 and 3,000.

Sheepbridge Equipment Ltd. recently reported an increased productive capacity for pit tubs and mine cars, when they announced the opening of a new fabricating and assembly shop at their Chesterfield works for the flow production of mining equipment.

Coal Deliveries Through Pipeline

Coal will soon be transported by pipeline over 108 miles from an Ohio mine to the city of Cleveland, United States. A contract to begin deliveries of 18,000,000 tons of coal through the pipeline was signed recently between a Pittsburgh coal producing firm and the utility company that supplies Cleveland with electricity. Three railway companies will co-operate in the project.

The coal will be mined at Georgetown, Ohio, in a mine owned by the Pittsburgh company. After being cleaned and pulverized, it will be mixed with water and pumped through the pipeline. Company officials estimate that the project will cost between \$8,000,000 and \$10,000,000. The special pipeline is the result of five years of research costing \$1,000,000.

METALS, MINERALS AND ALLOYS

COPPER.—The new wage agreement reached at the American Metal Co.'s Carteret refinery on Thursday of last week was followed by Anaconda's new offer to the Mine-Mill Union on Monday which shows signs of being accepted. Together, they suggest that a new wage pattern is being worked out which may result in a resumption of work at the A.S. and R., Phelps-Dodge, and Kennecott properties, which have been on strike for over a week and must have already lost the industry getting on for 20,000 tons of copper production.

Significantly, negotiations at the Carteret refinery and over Anaconda's Montana operations have been conducted without the union having recourse to strike action. Indeed, the existing labour contracts only expired at the end of June. The Carteret settlement involved a package increase of 16½ c. an hour, including an average wage increase of 11½ c., the remainder representing improvements in pension and other fringe benefits. Last Monday's revised Anaconda offer provides for a wage increase ranging from 11½ c. an hour for the lowest grade to 17½ c. for the top grade workers. This offer was apparently well received by the union although it does not include certain fringe benefits for which it was asking. The Butte (Montana) local branch of the union was expected to hold a referendum on the offer yesterday. Pending the outcome of these negotiations further developments can hardly be expected at those properties which have been struck.

It may well be that over 30,000 tons of production will have been lost by the time the strikes come to an end, which can only serve to aggravate the already critical supply position in the States, and also to increase the likelihood that the producers will be forced to raise their official price substantially above the 36 c. level. Although marketwise it may at first sight appear that this is of minor importance while the effective market price remains around the 45 c. (at which New York is reported to have been buying in Europe recently) the decision to raise the official price—if the increase was big enough—would presumably have a significant effect on the amount of Chilean copper finding its way to the States, since at present world prices there is no inducement for the Chilean Government to supply a single ton more than its contractual obligations demand at the 36 c. level. (Parenthetically it can be reported that the nine-day strike of Chilean transport workers ended last Saturday.)

Moreover, the present disparity between the official price and the effective market price must be causing considerable difficulties for the independent U.S. fabricators who must to greater or less extent buy their requirements at the market in competition with integrated fabricators who are still buying mainly at 36 c. In fact the same kind of difficulties must be present to those confronting the trade in this country as the result of the R.S.T.'s present pricing policy. It appears to be fairly generally accepted that U.S. fabricators would have little difficulty in getting consumers to accept a price level based on the higher average copper price which would result from, say, a 4 c. increase in the producers' official price. Certainly there can be little doubt that for the moment the problem for the American user is one of availability rather than price and it may well be that the producers face a bigger immediate threat from substitutes through the non-availability of copper than through its exceptionally high price. As the Rhodesian Anglo-American group pointed out when the R.S.T. scheme was being mooted at the beginning of this year, the price of copper is so high anyway at the moment that the problem of reducing it to a level where the metal's long-term competitive position can be safeguarded must for the moment remain largely academic.

The uncertainty for the American producers in raising the official price turns, of course, on how the London market will react. If prices are advanced to a point where large tonnages of copper are diverted to the States, it could be that the only consequence would be to force both the London and the free U.S. market prices further ahead to nobody's advantage. On the other hand if the diversions were not too substantial and if, as our London Metal Exchange correspondent suggested last week, we are within sight of an easier supply position on the London market, the increase might be beneficial. On balance, however, it seems more probable that the London market's gradually and hardly won improvement in its stock position would be protected by an equivalent rise in price.

Were this to prove the case, the U.S. independent fabricators' difficulties would be more likely to be met by some price equalization arrangement in which integrated firms might be expected to participate as an alternative to raising the producers' official prices.

Offers made by the Copperbelt mining companies last week and accepted by their African employees will result in the

immediate consolidation of cost of living allowances into the basic pay, and at the same time in the doubling of the variable copper bonuses together with an increase in cost of living allowances. It has been estimated that these concessions will cost the companies between £500,000 and £750,000 a year and that all Africans on the mines will benefit by between 25s. 6d. and 57s. 6d. a month. This new award, the first since the Guillebaud award some two years ago, is reported to have notably eased relations with the African unions. On the other hand, it remains to be seen how the European employees will react, more particularly those of its members affected by the R.S.T. Group's decision to gear copper bonuses to their controlled copper selling price, which currently is some £60 below the market price.

LEAD AND ZINC.—The shut-down of the A.S. and R.'s lead plants due to that company's dispute with the Mine-Mill union (the outcome of which depends of course primarily on negotiations at its copper properties) has resulted in the company ceasing for the moment to be a seller of lead. Nevertheless, it is reported from New York that other producers unaffected by the strike have not gained covering orders to the extent which might have been expected, which suggests that at 15 c. lead is not for the moment under any great pressure.

The G.S.A. was reported last week to have issued their usual monthly invitation for offerings of lead and zinc, although presumably the tonnages taken for the stockpile this month will again not be very large. According to the American Zinc Institute figures, May shipments of zinc for government account totalled 10,434 tons, but this figure presumably reflects offerings made to the G.S.A. in March. This month's offerings will not be deliverable until September. Other Zinc Institute figures show slab zinc stocks held by smelters at the end of June as the lowest for any month since 1952 at 48,612 tons (compared with 63,184 at the end of May), despite the fact that production of slab zinc in June at 84,467 tons was some 300 tons better than in May and some 13,000 tons better than in June a year ago.

Production of galvanized sheets in the States continues to boom with total shipments during the first five months of this year amounting to 1,124,121 tons compared with 920,700 in the corresponding period of 1954 and about 977,000 tons in the corresponding period of 1953.

TIN.—News from Indonesia this week suggests the probability that the government's bill to ratify the I.T.A. will be through by the end of the month. This would assure the necessary number of producer votes, while now that the French parliament has approved the agreement the necessary number of consumer votes are virtually assured. It would, therefore, appear as if the I.T.A. organization could be established officially before the end of the year in plenty of time for the machinery to be in operation before the end of the 12 months' extension to the Texas smelter's operation.

The indications are that marketwise the I.T.A. will be starting operations in a slightly more favourable climate than would have been the case last autumn. Estimates of world tin consumption for this year are surprisingly unanimous in putting the figure at around 145,000 tons (excluding the U.S.S.R. and China) compared with 136,000 last year. What appears less certain, however, is the way that production is moving. From the table below it will be apparent that for the six leading producers, production has been trending upwards and if these figures were to be maintained we might see an increase on the year from these countries alone of as much as 8,000 to 10,000

Country	Period	1955	1954
Belgian Congo	Jan.-May	6,146	3,640
Bolivia*	Jan.-April	8,220	6,999
Indonesia	Jan.-June	15,245	15,962
Malaya	Jan.-May	25,122	24,485
Thailand	Jan.-May	4,080	3,799
Nigeria	Jan.-April	2,784	2,625

* Exports

tons. On the other hand, the Tin Study Group bulletin, on the basis of four months' figures (admittedly a very rough yardstick), estimates world production for the year at about 155,000 tons (again excluding U.S.S.R. and China) compared with about 169,000 last year. A. Strauss and Co. in their monthly review for July suggest that on balance production is unlikely to differ substantially from last year and tentatively proffer an estimate of 167,000 tons. This guess, while perhaps on the low side, is probably as good as any, and on this basis we might expect to see a reduction in the surplus of world production over consumption to around 25,000 tons.

Although the strike at the Texas smelter ended last weekend, output for the first six months is running well below last year at 11,800 tons (against 15,583 tons) and as there is no news as yet of the further extension of Washington's temporary Bolivian and Indonesian ore contracts, it seems not unreasonable to assume—in view of America's expressed "benevolent neutrality"—that production from the smelter through to next June will be geared as carefully as possible to the estimated world surplus to give the I.T.A. as fair a start as possible.

Whether the Texas smelter continues in operation after next June remains, of course, to be seen, but, as we have often had occasion to point out, there is no necessary connection between the continuation of the smelter and of American stockpiling, and if the Texas lobby proves strong enough it would not be inconceivable to see the smelter in continued production and selling on the open market.

ALUMINIUM.—Following on steel and the base metals, the American aluminium producers are now confronted with the necessity of reaching revised wage agreements by the end of this month if a stoppage is to be averted. One of the by-products of the recent C.I.O. - A.F. of L. merger may be seen in the fact that for the first time Alcoa has instituted joint bargaining negotiations this week with the Steelworkers Union (C.I.O.) and the Aluminium Workers (A.F. of L.).

The U.S. Department of Commerce has made a sharp cut back in the aluminium scrap export quota for the third quarter of the year. The quota has been set at 5,000 s.tons against 9,000 s.tons in the first and second quarters.

The West German Parliament has now approved the government ordinance providing for the duty free import of up to 20,000 tons of aluminium during the second half of this year (see this column July 1, page 18).

COLUMBIUM.—We understand that Kennecott Copper, in conjunction with the Molybdenum Corporation of America, are to open up a columbite-tantalite deposit at Oka, near Montreal.

MAGNESIUM.—Both Dominion Magnesium and Alcan have recently raised their domestic and export prices, the domestic price going up by 1 c. per lb. The effect of this has been to raise the U.K. price of imported Canadian magnesium to 2s. 4d. per lb. for primary ingot. The U.K. producer's price has also come into line with this rise.

TITANIUM.—According to the Melbourne correspondent of the *Financial Times*, Titanium Minerals is to give an option to Metal Traders, London, to subscribe at par during the next three years for 240,000 shares of 5s. This is in return for advances by Metal Traders to assist rehabilitating the company. Metal Traders will be appointed selling agents for five years.

TUNGSTEN.—The South Korean Government, through its Taihan Tungsten Corporation, will hold its seventh international auction on July 19. The amount on offer on this occasion is stated to be 350 tons of high grade ore.

QUICKSILVER.—Both in London and New York the quicksilver price has been easing over the past week—by about £8 a flask here, while the New York price is only nominally quoted at \$270-\$273 as against \$275-\$280 in the middle of last week. A considerable amount of Mexican mercury is known to have been on offer in London in recent weeks at around £93 a flask—this lower price reflecting the relatively low purity of this production (about 99.8 per cent). There appear to be conflicting views as to just how much Mexican metal has found its way to London and it seems likely that calculations have been somewhat upset by the hold-up of shipments during the dock strike which may only now be making their presence felt. Be that as it may, the falling price for the high grade metal suggests that the European producers are content to allow prices to return to more normal levels rather than reduce their offerings.

Production of Mexican quicksilver last year is believed to have been about 12,000 flasks but preliminary estimates for this year have been putting the figure at as high as 18,000.

The London Metal Market

(From Our Metal Exchange Correspondent)

Since writing the last report the copper market has become completely dominated by the American situation which is now viewed as being extremely grave as far as supplies are concerned, and in fact some European copper has already been sold to the U.S.A. and it is understood that some small shipments from this country are also pending. This American buying interest, which has resulted in as much as 47 c. per lb. c.i.f. being paid, has caused the standard market to rise and the back-wardation to increase in spite of fairly heavy deliveries which are taking place this week.

Continental consumers have reverted to a hand-to-mouth buying policy, but sufficient orders are still being taken to maintain a firm undertone. It is extremely difficult to forecast price movements for the near future, but if the U.S. strike is prolonged no combination of other factors will be strong enough to prevent the market from rising still further. There is no doubt that the majority of copper producers would prefer to see a lower price level than that existing at the moment, and therefore the long-term view must be that prices will recede when there is a cessation in the present continuous cycle of strikes.

The tin market has remained firm with consumer demand showing a tendency to increase, and it would not be surprising to see the price reach the upper operating limit of the proposed International Tin Agreement. It is now understood that the Indonesians are actively considering signing this agreement, and a decision should be forthcoming in a matter of weeks. On Thursday morning the Eastern price was equivalent to £755½ per ton c.i.f. Europe.

Both lead and zinc have been firmer on good demand and continued improvement in the statistical position in the States. Talk of price rises is now less than it was some weeks ago, but the reason for this is obscure and it must not be assumed that producers will not alter the prices upward immediately a suitable opportunity occurs.

Closing prices and turnovers are given in the following table:—

	July 7		July 14	
	Buyers	Sellers	Buyers	Sellers
Copper				
Cash	£337½	£338	£346	£347
Three months	£332	£333	£339½	£340
Settlement		£338		£347
Week's turnover		2,875 tons		4,075 tons
Tin				
Cash	£730	£730½	£744	£746
Three months	£727½	£728	£739	£740
Settlement		£730½		£746
Week's turnover		465 tons		780 tons
Lead				
Current half month	£104½	£105½	£105½	£105½
Three months	£104½	£105	£105½	£105½
Week's turnover		4,275 tons		2,975 tons
Zinc				
Current half month	£91½	£92½	£91	£91½
Three months	£91½	£91½	£91	£91½
Week's turnover		3,825 tons		3,825 tons

OTHER LONDON PRICES — JULY 14

METALS

Aluminium, 99.5%, £171 per ton	Magnesium, 2s. 4d. lb.
Antimony—	Nickel, 99.5% (home trade)
English (99%) delivered, 10	£519 per ton
cwt. and over £210 per ton	Osmium, £27 oz. nom.
Crude (70%) £200 per ton	Osmiridium, £40 oz. nom.
Ore (60% basis) 22s./24s. nom.	Palladium, £6 12s. 6d./£7 5s. oz.
per unit, c.i.f.	Platinum, £27 10s./£29
Bismuth	Rhodium, £40
(min. 2 cwt. lots) 16s. lb.	Ruthenium, £16 oz.
Cadmium (Empire) nominal	Quicksilver, £108
Chromium, 6s. 7d./7s. 1d. lb.	ex-warehouse
Cobalt, 21s. lb.	Selenium, 43s. nom.
Gold, 251s. 9d.	per lb.
Iridium, £30 oz. nom.	Silver, 78½d.-78½d. f.oz. spot and
Manganese Metal (96%-98%)	76½d. f'd
£225/£262 according to	Tellurium, 15s./16s. lb.
quantity	

ORES, ALLOYS, ETC.

Bismuth	65% 8s. 6d. lb. c.i.f.
	50% 7s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semi-	
friable) 48% ..	£13 per ton c.i.f.
Refractory 45% ..	£13 per ton c.i.f.
Smalls 42% ..	£10 2s. 6d. per ton c.i.f.
Magnesite, ground calcined ..	£26-£27 d/d
Magnesite, Raw ..	£10-£11 d/d
Molybdenite (85% basis) ..	105s. 3d.-108s. 1d. per unit c.i.f.
Wolfram and Scheelite (65%) ..	250s./255s. c.i.f.
Tungsten Metal Powder ..	20s. 2d. nom. per lb. (home)
(98% Min. W.)	
Ferro-tungsten (80%-85%) ..	17s. 2d. nom. per lb. (home)
Carbide, 4-cwt. lots ..	£37 6s. 3d. d/d per ton
Ferro-manganese, home	£53 17s. 6d. per ton
Manganese Ore Indian c.i.f.	
Europe (46%-48%) ..	70d./73d. per unit
Manganese Ore (38%-40%) ..	46d./51d. per unit
Brass Wire ..	3s. 3d. per lb. basis
Brass Tubes, solid drawn ..	2s. 7½d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Stock markets were rather erratic during the past week. Turnover, while declining, remained at a reasonably high level. The sharp increase in coal prices caused markets to begin with an initial setback. Gilt edged suffered from the continued squeeze on bank lending but generally appeared steady at the lower levels.

Kaffirs generally had a rather uninspiring week. There was selective demand for certain finance houses and Anglo American Corporation, Rand Selection, and Union Corporation showed quiet advances. The last named company improved due to modest Johannesburg demand following renewed rumours concerning prospects in the Bethel area.

Individual Rand mines mostly drifted lower and slight selling of some of the older producers brought about disproportionate falls in price. The whole market was awaiting without much enthusiasm the quarterly returns. Hartbeesfontein suffered from rumour and counter rumour; the latter, emanating from Johannesburg, suggested that the quarterly returns from this company might be disappointing. Buffelsfontein, however, have sprung to life on Johannesburg buying which in turn has been prompted by the report of a good reef strike in the twin shafts which are being sunk in the north-western part of the property. Both shafts were down to over 3,000 ft. at the end of the March quarter.

In the Orange Free State group, share prices were less affected by this malaise, and changes were generally small and erratic. Certain features stood out from the ruck. Harmony fell 1s. 6d. on the news that there was a fire at the property. It was also rumoured that the Consolidated Goldfields group might be liquidating some of their shares in order to take up the impending Saaiplaas issue, dealings in which opened yesterday morning at 9s. premium. Loraine hardened, despite the company's loss last month, and President Brand were a feature. The mine, despite its fairly low initial production is now the cheapest producer per ounce recovered in South Africa. President Steyn improved in sympathy and rumours that a satisfactory quarterly return might be expected from St. Helena caused a rise in the price of these shares also.

There was little of interest in the West African and West Australian markets, although the Sons of Gwalia production had been reduced by heavy rain and the derailment of a shaft skip.

In the miscellaneous group, Camp Bird eased to 18s. after touching 18s. 4½d.; the company's new Board has declared an interim dividend of 7½ per cent as against a total of 10 per cent for the previous year. The six-monthly profit figures are well up. Another feature was Zams which hardened on the rise in Tanks. St. John d'El Rey also improved due to optimism concerning affairs in Brazil.

Coppers were one of the best features among mining shares because of the continued rise of the metal price. A steady investment demand continued for Chartered but Rio Tinto fell back sharply from last week's peak due to profit taking. Bancroft have been dull following the news in a progress report for the half year to March 4 last that considerable volumes of water underground have retarded progress. It is thought, however, that since the end of the period in question difficulties in this direction may have been substantially overcome. Otherwise progress at this property has been satisfactory enough with shaft sinking fully up to schedule. Selection Trust, due to favourable market comment on the outlook, leaped ahead.

The tight position in tin brought about by exceptionally large Argentine buying failed to stir a sluggish market. Both the eastern and Nigerian sections had little of interest to report although there was some buying of British Tin Investment due to hopes concerning the year's dividends.

Lead/zinc shares mostly did well, particularly **Barriers**. Good gains were recorded by the leading companies due to steady metal prices and Mount Isa were particularly favoured on the company's figures and the output of blister copper. **Lake George** returned to speculative favour and **San Francisco Mines** regained some of their previous losses.

In the miscellaneous base metal market, there was renewed interest in Consolidated Murchison and quiet buying of some of the South African coal shares. The fall in Associated Manganese was connected with the recent passing of the dividend and switching by stale bulls into more luscious fields.

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COMPANY NEWS AND VIEWS

Rand and O.F.S. June Quarterlies

At the time of going to press quarterly reports in respect of the three months ended June 30 have been published by the Anglo American and Union Corporation groups. From a market point of view, anyway, the continued absence of any startling development results from the "area of exceptional enrichment" to the south of Free State Geduld No. 2 shaft must necessarily have a dampening effect on O.F.S. counters. It was encouraging, however, that despite the heavy inrush of water in the No. 2 shaft area, development operations speeded up considerably in the 41 Haulage North. But even in its present depressed state the market should draw confidence from the continued excellent results at President Brand. The attention due to this very much undervalued share is long overdue. Welkom and St. Helena, however, failed to come up to expectations, and results both in payability and values declined from those in the previous quarter.

Taking the results from these mines more specifically, Free State Geduld is revealed, somewhat unexpectedly, to have sampled a greater footage during the past three months at 2,615 ft., as compared with 2,225 ft. This rise was due to increased activity in the No. 1 shaft area. Overall payability rose by 3 per cent to 93 per cent, while values remained virtually unchanged at 706 in. dwt. In the No. 2 shaft area a total of 1,235 ft. against 419 ft. previously were accomplished in Haulage 41 North. Of this footage 265 ft. were sampled as compared with 175 ft. which disclosed payability unchanged at 100 per cent. Values averaged about 337 dwt. of gold over 5.26 in. equivalent to 1,773 in. dwt. This compares with 333 dwt. over 5 in., equivalent to 1,665 in. dwt. during the previous three months.

At President Brand a total of 2,825 ft. were sampled compared with 2,960 ft. during the previous quarter. Payability rose by 2 per cent to 92 per cent while values although markedly above those of 975 in. dwt. disclosed at the recent annual general meeting towards the end of May, showed at 1,143 in. dwt. a slight decline from 1,227 in. dwt. in the March quarter. This slight difference is, of course, not very important and a continuance of average values amounting to about 1,100 in. dwt. is eminently satisfactory especially as a considerable amount of opening-up work is being done. It has also been reported from President Brand that work on the excavation of hoist chambers and bank layout for No. 2 sub-vertical twin-circular shafts was commenced last quarter. Besides this, a much increased uranium profit (before repayment of loans) of £55,014 was made. This compares with only £23,000 during the previous quarter.

The results from St. Helena were disappointing. From a total of 5,225 ft. sampled, compared with 4,755 ft. previously, values of 407 in. dwt. as against 417 in. dwt. were obtained. Payability declined to 52 per cent from 59 per cent. When considering the values disclosed for mines of the Union Corporation group, it is, however, wise to remember that figures given allow for a discount to conform with adjustments necessary in estimating ore reserves. Unlike the other major groups, these development values will therefore be higher than actually stated.

In the case of Welkom a greater footage was sampled at 6,265 ft., as compared with 4,590 ft., but values declined to 413 in. dwt. from 442 in. dwt. and payability fell to 71 per cent from 78 per cent. The return from Loraine, at which property crushing started only a few weeks ago, showed a serious drop in payability to 48 per cent from 77 per cent. Footage advanced fell to 3,025 ft. from 5,280 ft., while values also diminished to 248 in. dwt. from 288 in. dwt. The most notable feature of President Steyn's return was the greatly increased uranium profit at £89,478 compared with £35,600 before loan repayments. Yet while payability at this property remained constant, values declined to 554 in. dwt. from 632 in. dwt.

Amongst the older producers there was a good improvement in values obtained at East Geduld, which rose to 472 in. dwt. from 361 in. dwt. At Geduld Proprietary sampling on the Kimberley Reef showed a payability of 23 per cent as against 19 per cent., while values advanced sharply to 207 in. dwt. from 146 in. dwt. Values obtained from Daggafontein's Kimberley reef also rose to 569 in. dwt. from 519 in. dwt. Payability, however, declined to 28 per cent from 31 per cent. Brakpan reported in. dwt. up at 649 from 626, but payability fell away to 29 per cent from 30 per cent.

£2,500,000 Dutch Loan for Rhodesian Development Corporation

Following swiftly after the recent formation of the Anglo American Rhodesian Development Corporation with an authorized capital of £2,000,000 for the purpose of financing

development of natural and other resources in the Federation, it has been disclosed that a loan amounting to £2,500,000 in U.K. sterling has been secured by the new corporation from the Amsterdamsche Bank N.V., of Holland.

The loan, which will be issued at £98½ for public subscription in Holland, will bear interest at 4½ per cent, and is to run over 15 years. Redemption terms have been fixed at par in ten equal instalments, starting in 1961, subject to the corporation's right to accelerate redemption in whole or in part at a premium of one per cent during 1961-65, and thereafter at par.

At the time of the new corporation's formation it was stated that apart from initial subscriptions amounting to £500,000, by the Anglo American Corporation and associated companies, it was intended to raise money from other parts of the world. However, probably few people had thought of Holland as being one of the countries which might be interested in the new project. Indeed, the fact that any European country is at present prepared to take so favourable a view of sterling, comes as a most pleasant surprise to those in the U.K. who have for some time been made only too aware of Continental fears of imminent convertibility. In this respect, the absence of any Gold Clause is remarkable and it provides some confirmation of the conclusion reached in our leading note (page 39) last week.

Amalgamated Metals' Favourable Outlook

In a climate of rising metal prices during the year ended December 31, 1954, profits earned from trading activities by Amalgamated Metal Corporation moved up to £861,567 from £785,434. Dividends and interest added £198,804 (£173,914) to this figure.

Dividends on the Corporation's issued ordinary capital of £4,435,792 in £1 shares were raised to 9 per cent from 8 per cent previously.

Year to Dec. 31	Total* Revenue	Tax-ation	Net Profit	Divi-dends	To Reserve	Carry Forward
	£	£	£	£	£	£
1954	923,347	527,987	381,005	259,252	50,000	1,450,158
1953	878,402	513,440	364,209	224,875	Nil	1,378,405

* After charging £137,024 in respect of audit fees, depreciation and amounts written off. (1953 - £80,946).

Mr. Walter Gardner, the chairman, takes an optimistic view of the future outlook for both metal and rubber prices. In the case of the former, he pointed out in his statement to shareholders, metal markets had remained very firm so far during 1955 and assuming no serious upset occurred in the general expansion of U.S. business activity, it appeared that world usage of metals would rise to fresh high levels during the current year. As regards rubber, Mr. Gardner said that towards the end of 1954 it had become evident that the introduction of the tubeless tyre in the U.S.A. would lead to a substantial increase in rubber consumption during 1955. While U.S. rubber absorption was expected to reach a new record, usage outside the U.S.A. continued to be good and there should be little or no world surplus for the year. If world demand continued at its present rate, it seemed that all production, both natural and synthetic which could be achieved during the next few years, would be required.

The fortunes of the Amalgamated Metal Corporation are not, of course, entirely dependent upon the future of commodity prices, and through its subsidiaries, the British Metal Corporation, and Henry Gardner, it carries on many and varied business activities embracing general trading, and manufacturing. An interesting feature of Mr. Gardner's speech concerned the corporation's participation in U.K. metal mining. In conjunction with mining friends, the British Metal Corporation was, he stated, engaging in preliminary exploration work in several parts of Great Britain.

On purely financial considerations, the Amalgamated Metal Group is in a position of considerable strength. As at December 31, quoted investments shown on the balance sheet at £239,628 had a market valuation of £523,202. Net liquid assets amounted to some £4,300,000, including cash balances and British Government securities amounting to some £2,000,000. In relation to the issued capital, which comprises 900,000 6 per cent cumulative preference shares of £1, together with the 4,435,792 ordinary shares of £1, this figure is exceptionally large. The only adverse entry on an otherwise excellent balance sheet is an amount of £1,435,846 representing goodwill.

At their present price of around 25s. x.d., the £1 ordinary shares return the very acceptable yield of about 7 per cent. Meeting, London, August 4.

Camp Bird Pays 7½ Per Cent Interim

An interim dividend of 7½ per cent has been declared by Camp Bird for the year ending December 31, 1955. This payment represents a departure from the previous practice of paying only one dividend in respect of any particular financial year. Last year the total distribution was 10 per cent.

The estimated gross income from investments for the half year to June 30, 1955—subject to audit—amounted to £75,377 as against £39,069 in the previous corresponding period. Capital profit on realizations of investments during the past six months was £287,590. As at June 30, 1955, the market value of quoted investments was £2,146,744 compared with £1,963,000 as at March 15, 1955.

Subject to there being no major change, it is estimated that investment income for the second half of the current year will be considerably higher than that of the past six months. It is intended to issue a statement concerning the company's affairs up to June 30 within the next fortnight.

Company Shorts

Discussions Begun on S.A. Mine Workers' 15 Per Cent Demand.—Discussions began on July 12 between the Mining Union's Joint Committee and the Transvaal and O.F.S. Chamber of Mines on the former's 15 per cent wage demand for daily paid mine-workers throughout South Africa.

Lydenburg Offers Saaiplaas Shares to Stockholders.—It has been announced by Lydenburg Estates that in terms of agreements with Middle Witwatersrand (Western Areas) it has received the right to take up shares at par in the new Free State Saaiplaas Gold Mining Co. It has been decided, however, to offer these shares to stockholders at par in the proportion of one for four. A circular giving further details of the offer will be posted on July 20.

Pasic Claim Reduced to £2,616,486.—Following circulars to shareholders of Selection Trust and Trepca Mines on July 7, stating that the companies had recently been served with a Writ

of Summons claiming £10,934,670 in respect of Mr. Radomir Pasic, it has now been announced that the amount involved has been reduced to £2,616,486. Mr. Pasic's alternative claim, based on the alleged wrongful deprivation of mineral concentrates, is now placed at £2,619,166.

Yukon Consolidated's Higher Profits.—Net profits earned by The Yukon Consolidated Gold Corporation during the year ended December 31, 1954, rose to \$382,182.16 from \$255,887.80. After providing for a dividend of 6 c. per share (same) on its issued ordinary stock of \$5,951,861 which absorbed \$357,111.66 (\$357,104.46) the balance carried forward moved up to \$1,958,561.98 from \$1,933,491.48.

In his statement to stockholders Mr. Robert Annan, the president, stated that the corporation's dredges operated for a total of 1,386 dredging days as compared with 1,138 days during 1953. Yardage mined was 5,115,815 at a cost of 25.56 c. per cu. yd. This compares with 4,340,557 cu. yd. in 1953 at a cost of 28.95 c.

S.E. House Journal.—The appearance of the Stock Exchange Journal marks another step forward in Sir John Braithwaite's drive towards a greater public understanding of this famous institution's functions. As Mr. C. F. Cobbold, governor of the Bank of England, says in his forward, the Journal will, while covering official, social and personal aspects of the Stock Exchange, also provide another forum for discussion of topics of general interest to the City.

It is greatly to be hoped that Sir John Braithwaite's untiring efforts since the war, which have amongst other things resulted in the installation of a visitor's gallery at the "House," will bring about a greater participation in industry by those who have not hitherto acted as investors. It was in this way that the tremendous opportunities held out by the Industrial Revolution of an earlier day were fully exploited. This is not to say that the greater part of the United Kingdom's population is entirely removed from the sphere of investment. Indeed, even amongst the greatest critics of the capitalist system are enormous numbers who by participating in pension and other similar insurance schemes, rely upon the continuity of industrial profits and dividends to provide for their old age and retirement.

KADUNA PROSPECTORS LIMITED

The 40th ordinary general meeting of Kaduna Prospectors Limited was held on July 12 in London, **Capt. Hugh Vivian, M.Inst.M.M.**, (the chairman) presiding.

The following is an extract from his circulated statement:—

Production during the year amounted to 70 tons of tin concentrate of shipping grade, compared with the exceptional output of 116 tons in 1953.

The average cost per ton of concentrate delivered f.o.r. was £312 10s. 2d., as compared with £250 6s. 11d. in the previous year and £331 17s. 7d. in 1952. Sales of tin ore amounted to 70 tons and realized £36,478, an average of £521 2s. 4d. per ton. Mining profit for the year was £6,517 as compared with £9,144 in the previous year.

To the net profit of £2,723 have been added the balance of unappropriated profits brought forward, £2,745, and previous provision for taxation no longer required, £1,444, giving a total available balance of £6,912. An interim dividend of 8½ per cent., less income tax, was paid on February 1, 1955, and the Directors now recommend a final dividend of 16½ per cent., less income tax, making 25 per cent. for the year, absorbing £2,833 and leaving £3,079 to be carried forward.

The total production shows a reduction from the previous year of 46 tons, the decrease being general but the biggest fall being in the Werran Areas. The average value of ground worked, apart from tribute tin and the retreatment of tailings, was only 0.51 lbs. per cubic yard compared with 0.68 lbs. per cubic yard in the previous year.

At December 31, 1954, measured reserves totalled 69 tons and indicated reserves 43 tons, making a total of 112 tons. The Board feel it necessary to point out to shareholders that the mine appears to be nearing the end of its economic life. Only one area remains to be completely prospected and so far the results obtained are definitely disappointing. This, in conjunction with the ever increasing costs of wages and materials and the continued unsatisfactory price of tin, has rendered a considerable amount of low grade ground unpayable. In these circumstances, the Board regard the future of the Company with considerable anxiety.

Output for the current year to the end of May was 28 tons, as compared with 31 tons for the corresponding period of last year.

The report and accounts were adopted.

THE KADUNA SYNDICATE LIMITED

The 44th ordinary general meeting of The Kaduna Syndicate Limited was held on July 12 in London, **Capt. Hugh Vivian, M.Inst.M.M.**, (the chairman), presiding.

The following is an extract from his circulated statement:

Production during the year amounted to 332 tons of tin concentrate of shipping grade, compared with 327 tons in 1953. The average cost per ton of concentrate delivered f.o.r. was £196 2s. 1d. as compared with £232 6s. 1d. in the previous year, and £272 7s. 9d. in 1952. Sales of tin ore amounted to 340 tons and realized £173,667, an average of £510 15s. 8d. per ton. In the previous year, 345 tons were sold at an average price of £505 16s. 6d. per ton.

Mining profit for the year was £62,996, as compared with £36,006 in the previous year.

To this mining profit there have been added £2,345, income from investments, £351, interest received and £205, miscellaneous receipts. During the year expenditure on advance stripping amounted to £4,206, and on prospecting on exclusive prospecting licences £188, which amounts have been written off. There has been provided for profits tax on the profits of the year £7,900, and for income tax £26,480, leaving a net profit for the year of £27,123.

To this net profit of £27,123 have been added the balance of unappropriated profits brought forward, £12,764, and previous provision for taxation no longer required, £221. An interim dividend of 25 per cent., less income tax, was paid on February 1, 1955, and the Directors now recommend a final dividend of 41½ per cent., less income tax, making 66½ per cent. for the year.

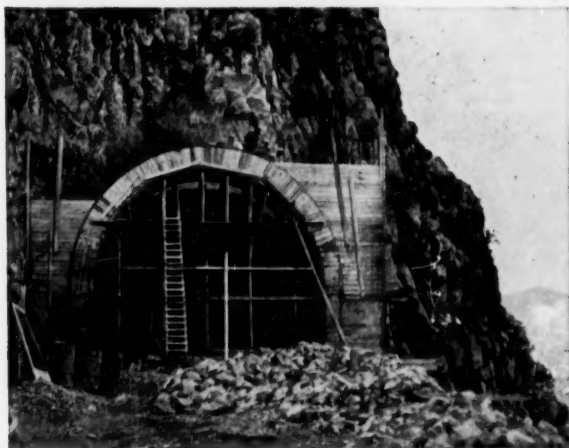
During the year 88 tons of ore have been proved by prospecting and 241 tons were won from the ore reserves during that period. At December 31, 1954, proved reserves totalled 498 tons and indicated reserves 124 tons, making a total of 622 tons. The working of certain portions of the ore reserves has resulted in indicating the presence of 370 tons of concentrate over and above the original estimate. The Board has decided not to include this probable excess in the declared tonnage of ore reserves but to hold it against possible shortages in future years.

Output for the current year to the end of May was 123 tons, as compared with 112½ tons for the corresponding period of last year.

The report and accounts were adopted.

ATLAS COPCO LOADER HELPS BUILD TWO-TUNNEL MOUNTAIN ROAD IN SICILY

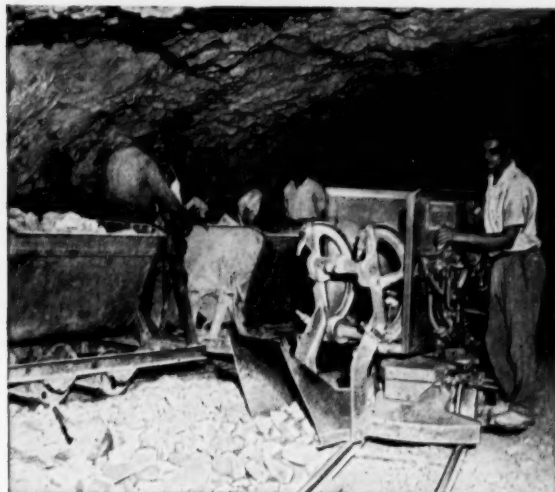
The new Sicilian road will run from the Sanctuary of Santa Rosalia on Monte Pellegrino (1,968 ft. above sea level) to Lido di Mondello, a resort north of Palermo. Total length of the road is 8,350 yards; the two tunnels are 120 and 257 yards long respectively. Contractors were Ing. Francesco Caruso of Palermo.



Obstacles were many for such a short road. Sharp gradients, steep walls and the necessity of blasting through poor rock formation—upper cretaceous limestone. Driving the tunnels, therefore, was in 5 successive steps: pilot tunnel, enlargement of the upper part, timbering and centering, drilling and blasting of central bottom heading and enlargement of side areas.



One side of the new road commands a fine view of the beautiful Golden Basin. In the foreground of this photograph is the Atlas Copco LM 35 Loader which worked on the 350-million lire project. Atlas Copco loaders are a decided advance in this type of machine. Wherever they are in use, drilling and clearance becomes a smooth and combined operation.



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THE ATLAS COPCO GROUP OF COMPANIES

KINTA TIN MINES, LTD.

MR. A. G. GLENISTER'S REVIEW

The fifty-fourth annual general meeting of Kinta Tin Mines, Ltd., was held on July 14 at 65 London Wall, London, E.C.

Mr. A. G. Glenister, Chairman, presided.

The following is the Statement of the Chairman circulated with the Report and Accounts for the year ended December 31, 1954:—

The working profit for the year, before charging taxation is £76,678 which, with the addition of £18,877 brought forward from the previous year makes a total credit of £95,555. The year's expenditure on property and plant, £4,148, has been written off and, in view of the decline in quotations for Government Stocks, £1,000 has been added to Investment Reserve.

Five interim dividends totalling 2s. 1½d. per share (less income tax) have been declared in respect of the year under review and these have absorbed £28,350 leaving a balance of £21,782 which the Directors recommend should be carried forward to the current year. Once again taxation has been very high and Tin Export Duty and Taxation together make a total of £68,014 contributed by the Company during the year to Malayan and United Kingdom funds.

DETAILS OF OPERATIONS

The General Managers' report, circulated with the Report and Accounts, contains details of the operations at the mine. The output was 352 tons of tin ore from the treatment of 1,170,800 cubic yards of ground as against 339 tons obtained the previous year from the treatment of 1,140,100 cubic yards. The average recovery per cubic yard remained the same at .67 lb. per cubic yard. The tin ore produced realized an average of £416 per ton as against £407 per ton in 1953 and the use of electric power was again reflected in a rise in the working cost per cubic yard from 15.74 pence to 16.00 pence.

It will be noted from the General Managers' report that, during the current year, mining operations at the Lallang Section will be completed and all plant and equipment concentrated at the Damak Section. It is anticipated that, on completion of this transfer a satisfactory rate of output will be maintained. The output for the first five months of the year totals 151 tons compared with 120 tons for the same period in the previous year.

PROPOSED INTERNATIONAL AGREEMENT

The proposed International Tin Agreement, which, when I addressed you last year, still awaited examination and signature, was subsequently signed by the necessary number of producing and consuming countries, but the required minimum number of ratifications has yet to be obtained. The future therefore still remains uncertain but, as I told you last year, your Company is well equipped both financially and at the mine.

Whatever the outcome, we can face the future with confidence as during past years we have built up substantial reserves. Our taxation position arising from the war is not yet agreed and there will be financial obligations in connection with the International Tin Agreement should it be brought into operation. These matters are in process of being cleared up and we are examining the position, with our financial advisers, with due regard to the Company's requirements for the future. Until this examination has been completed, it is impossible for me to anticipate the probable conclusions.

In Malaya, the security position continues to improve over the country as a whole, but not in all districts. The need for constant vigilance continues and I wish once again, on behalf of us all, to thank our General Managers and the staff at the mine, both European and Asian, for their efficient services to the Company.

The report and accounts were adopted.

DIVIDENDS

African and European Investment 3% (August 15)
Amalgamated Collieries of South Africa 1s. 3d. (August 15)
Apex Mines 25% (August 4)
British New Guinea Development 11% (July 30)
Cons. Diamond Mines of S.W. Africa 50% *i* (August 16)
Natal Coal Exploration 3d. (August 15)
Springbok Colliery 7½d. (August 15)
South African Coal Estates 2s. (August 15)
Tehidy Minerals 10%
Vereeniging Brick and Tile 4½d. *i* (August 12)
Vereeniging Estates 2s. *i* (August 12)
Westminster Bank "A" 6½% *i*; "B" 8% *i* (Aug. 2)
West Rand Investment Trust 9d. *i* (August 4)

i interim

TANJONG TIN DREDGING, LTD.

MR. A. G. GLENISTER'S REVIEW

The twenty-ninth annual general meeting of Tanjong Tin Dredging, Ltd., was held on July 14 at 65 London Wall, London, E.C.

Mr. A. G. Glenister, Chairman, presided.

The following is the Statement of the Chairman circulated with the Report and Accounts for the year ended December 31, 1954:—

The profit for the year, before charging taxation, is £150,111. £46,707 was brought forward from the previous year and this makes a total of £196,818 from which must be deducted the provision necessary for taxation on the year's profit amounting to £88,000. £30,854, including £2,668 expended on the Grab Dredger Experiment, has been applied to the depreciation of fixed assets and, in view of the fall in quotations for Government Stocks, £1,000 has been added to Investment Reserve.

Five dividends amounting to a total of 2s. 9d. per share (less income tax) have been declared which have absorbed £57,144. After the addition of £3,582 received on account of adjustment of insurance premiums paid in previous years, there remains a balance of £23,402 to the credit of Profit and Loss Appropriation Account, which your Directors recommend should be carried forward to the current year.

The full impact of the high rate of taxation has again been felt and the Tin Export Duty and Taxation paid make, together, a total of £149,037 contributed by the Company during the year under review to Malayan and United Kingdom Government funds.

OUTPUT AND PRICE

Full details of the year's working at the mine are given in the General Managers' report circulated with the report and accounts. The output was 776 tons of tin-ore as against 780 tons for the previous year. This was obtained from the treatment of 4,637,100 cubic yards of ground and represents an average recovery of .37 lb. per cubic yard. The corresponding figures for the preceding year were 4,552,000 cubic yards and .39 lb. per cubic yard.

The tin-ore produced realized an average price of £421 per ton as against an average price of £428 per ton during the previous year. Working costs at the mine per cubic yard were again reduced, the figure for the year under review being 8.82 pence per cubic yard as compared with 9.00 pence in 1953.

CURRENT YEAR'S RESULTS

No. 1 Dredge continued during the year on a southerly course through ground of somewhat lower grade. It has now reached the end of the sublease and is commencing to work in an area which is partly tailings and partly virgin ground. No. 2 Dredge operated in a northerly direction, passing mostly through ground previously treated to a depth of 60 feet until, in October, it reached virgin ground. In this it will continue to work with, the General Managers anticipate, good results. The total output from both dredges for the first five months of the current year is 395 tons compared with 282 tons for the same period in the previous year.

The requisite number of signatures to the proposed International Tin Agreement, which I mentioned in my statement last year, was subsequently received. The position remains uncertain however, as the required minimum number of ratifications has not yet been obtained.

As regards the Security position you will note from the General Managers' report that, although there were no terrorist incidents on the property itself, Security Forces were constantly active in the vicinity and it was necessary to expand defence measures. I am sure shareholders will join with me in once more expressing our gratitude to the General Managers and the staff at the mine, both European and Asian.

The report and accounts were adopted.

I.M.M. Symposium on Mineral Resources Policy

Last November Mr. D. A. Oliver, director of the B.S.A. Group Research Centre, presented a paper on "Mineral Resources Strategy" at a conference on research and industrial productivity which took place in London under the auspices of the D.S.I.R. and the British Productivity Council. The theme of Mr. Oliver's paper, which aroused considerable interest at the time, was that minerals productivity would be increased if greater co-ordination of the right kind could be established between all the interested parties—that is to say geologists, mineral dressing and mining specialists, mining and finance houses, mining engineers, local territorial authorities, fabricators and users, and finally government.

An opportunity is now to be provided by the Institution of Mining and Metallurgy for a fuller discussion of the proposals contained in Mr. Oliver's paper. The Institution is holding an all day Symposium on Mineral Resources Policy on Thursday, September 22, at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at which members and others concerned with the mineral resources problems of the British Commonwealth will be invited to consider whether some co-ordination of effort would be desirable in order to conserve supplies and expand output, and, if so, how this might best be achieved.

The following papers will be circulated in advance as a basis for discussion. They will not be read at the Symposium but will only be introduced very briefly by the authors so as to allow the maximum time for discussion.

Mineral resources strategy—a plea for a fresh approach, by Mr. D. A. Oliver, C.B.E., Director, B.S.A. Group Research Centre, Sheffield.

Mineral development and research in the U.S.A. and Canada (based on a tour with E.P.A. Mission No. 228), by Mr. J. Sandor, Department of Scientific and Industrial Research, London.

Aspects of the mineral industry in East Africa, by Dr. K. A. Davies, British Commonwealth Geological Liaison Officer, London.

How Canada aids its mineral industry, by Mr. R. J. Traill, former Head of the Mineral Dressing and Process Metallurgy Division, Mines Branch, Ottawa, and Dr. K. W. Downes, the present Chief of the Division.

Some economic considerations in a British mineral resources policy, by Mr. L. B. Pinnell, M.A., Chief Economist, Finance Corporation for Industry, Ltd., London.

Proposal for a central ore-dressing laboratory, by Dr. M. G. Fleming, Senior lecturer in mineral dressing, Royal School of Mines, London.

Those wishing to attend the discussions, who are not members of the Institution, are invited to write for full particulars as soon as possible to:—*The Secretary, The Institution of Mining and Metallurgy, Salisbury House, Finsbury Circus, London, E.C.2.* (Tel. NATional 0621).

Institution members and others unable to attend the Symposium are invited to send written contributions in advance of the meeting so that the views of as large a number as possible of those concerned may be known.

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